Dell™ PowerEdge™ 1955 Systems

Hardware Owners Manual

Notes, Notices, and Cautions

NOTE: A NOTE indicates important information that helps you make better use of your computer.

NOTICE: A NOTICE indicates either potential damage to hardware or loss of data and tells you how to avoid the problem.

CAUTION: A CAUTION indicates a potential for property damage, personal injury, or death.

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Contents

1 About Your System 9

Other Information You May Need **9**

System Overview **10**

System Status Features **10**

Server Module Features **12**

Using USB Diskette or USB CD Drives 16

Hard-Drive Features **16**

Back-Panel Features **18**

Power Supply Indicator 19

Fan Module Indicators 21

KVM Modules **22**

Avocent Analog KVM Switch Module 22

Avocent Digital Access KVM Switch Module 24

DRAC/MC Module **26**

Important I/O Configuration Considerations 27

DRAC/MC Firmware Requirements 28

I/O Connectivity **28**

Guidelines for Installing Connectivity Modules 28

PowerConnect 5316M Ethernet Switch Module 29

Fibre Channel Pass-Through Module 31

Fibre Channel Switch Module 32

Infiniband Pass-through Module 32

Gb Ethernet Pass-through Module 33

Server Module Messages **34**

Warning Messages **40**

Diagnostics Messages **40**

Alert Messages **41**

2 Using the System Setup Program 43

Entering the System Setup Program **43**
Responding to Error Messages 43
Using the System Setup Program 44

System Setup Options **44**
Main Screen 44
Memory Information Screen 47
CPU Information Screen 47
Integrated Devices Screen 48
Serial Communication Screen 49
System Security Screen 49
Exit Screen 50

System and Setup Password Features **51**
Using the System Password 51
Using the Setup Password 53

Disabling a Forgotten Password **54**

Acquiring the asset.com Utility **54**

Baseboard Management Controller Configuration **54**
Entering the BMC Setup Module 55
BMC Setup Module Options 55

3 Installing System Options 57

Power Supply Modules **58**
System Power Guidelines 58
Removing a Power Supply Module 58
Installing a Power Supply Module 59

Fan Modules **59**
Removing a Fan 60
Installing a Fan 61

DRAC/MC Module **61**
Removing a DRAC/MC Module 61
Installing a DRAC/MC Module 62
Important I/O Configuration Considerations 62
DRAC/MC Firmware Requirements 63

KVM Module **63**
Removing a KVM Module 63
Installing a KVM Module 63
Tiering an Avocent Analog KVM Switch or Avocent Digital Access KVM Switch From a Analog KVM Switch 65
Tiering an Avocent Analog KVM Switch From a Dell Console Switch . . . 68
Tiering an Avocent Digital Access KVM Switch From a Dell Console Switch 69

Chassis I/O Module **70**
I/O Module Placements 71
Installing an I/O Module 72

Server Modules **73**
Removing a Server Module 73
Installing a Server Module 74
Opening the Server Module 75
Closing the Server Module 76

Removing and Installing Server Module Components **77**
Memory 77
General Memory Module Installation Guidelines 78
Memory Sparing 78
Memory Mirroring 79
Sample Memory Configurations 80
I/O Module Daughter Card 82
Activating the Integrated NIC TOE 84
Processors 84
Server Module Battery 88
Hard Drives 89
Removing a Hard Drive 90
Configuring the Boot Drive 91
Removing a Hard Drive From a Hard-Drive Carrier 91
Installing a Hard Drive Into a Drive Carrier 91

Back-Panel Module Cage Assembly (Service-Only Procedure) **92**
Removing the Back-Panel Module Cage Assembly 92
Installing the Back-Panel Module Cage Assembly 93

Chassis Control Panel Assembly (Service-Only Procedure) **94**
Removing the Chassis Control Panel 94
Installing the Chassis Control Panel 95

Server Module Control Panel Assembly (Service-Only Procedure) **96**
Removing the Server Module Control Panel 96
Installing the Server Module Control Panel 97

System Board (Service-Only Procedure) **98**
Removing the System Board 98
Installing the System Board. 99

4 Troubleshooting Your System 101

Safety First—For You and Your System **101**

Start-Up Routine **101**

Checking the Equipment **101**

Troubleshooting External Connections **102**
Troubleshooting the Video Subsystem 102
Troubleshooting the Keyboard 103
Troubleshooting the Mouse. 104
Troubleshooting USB Devices 105

Responding to a Systems Management Alert Message. **105**

Troubleshooting a Wet System. **106**

Troubleshooting a Damaged System. **107**

Troubleshooting System Components **107**
Troubleshooting Power Supply Modules 107
Troubleshooting Fan Modules 108
Troubleshooting the DRAC/MC Module 109
Troubleshooting a Network Switch Module 110

Troubleshooting Server Module Components. **110**
Inside the Server Module. 111
Troubleshooting Server Module Memory 112
Troubleshooting Hard Drives 113
Troubleshooting Microprocessors 114
Troubleshooting the Server Module Board. 114
Troubleshooting the Server Module Battery 115

5 Running System Diagnostics 117

Using Server Administrator Diagnostics **117**

System Diagnostics Features **117**

When to Use the System Diagnostics **118**

Running the System Diagnostics **118**

From the Utility Partition 118

From a USB Flash Drive 118

System Diagnostics Testing Options **119**

Using the Advanced Testing Options **119**

Error Messages **120**

6 DIP Switch Settings and Connectors 121

DIP Switch Settings—A General Explanation **121**

DIP Switches 121

Server Module Board DIP Switch **122**

Server Module Board Connectors **123**

Disabling a Forgotten Password **126**

7 Getting Help 127

Technical Assistance **127**

Online Services 127

AutoTech Service 128

Automated Order-Status Service 128

Technical Support Service 128

Dell Enterprise Training and Certification **129**

Problems With Your Order **129**

Product Information **129**

Returning Items for Warranty Repair or Credit **129**

Before You Call **129**

Contacting Dell **132**

Glossary 149

Index 157

1

About Your System

Other Information You May Need

CAUTION: The *Product Information Guide* provides important safety and regulatory information. Warranty information may be included within this document or as a separate document.

- The *Rack Installation Guide* or *Rack Installation Instructions* included with your rack solution describes how to install your system into a rack.
- The *Getting Started Guide* provides an overview of system features, setting up your system, and technical specifications.
- The *Configuration Guide* provides information on initial configuration of the server modules and other modular components in your system.
- The *Dell OpenManage Baseboard Management Controller User's Guide* provides detailed information on using the Baseboard Management Controller (BMC).
- The *Dell Remote Access Controller/Modular Chassis User's Guide* provides detailed information on using the remote management features of the system.
- CDs included with your system provide documentation and tools for configuring and managing your system.
- Systems management software documentation describes the features, requirements, installation, and basic operation of the software.
- Operating system documentation describes how to install (if necessary), configure, and use the operating system software.
- Documentation for any components you purchased separately provides information to configure and install these options.
- Updates are sometimes included with the system to describe changes to the system, software, and/or documentation.

  NOTE: Always check for updates on **support.dell.com** and read the updates first because they often supersede information in other documents.

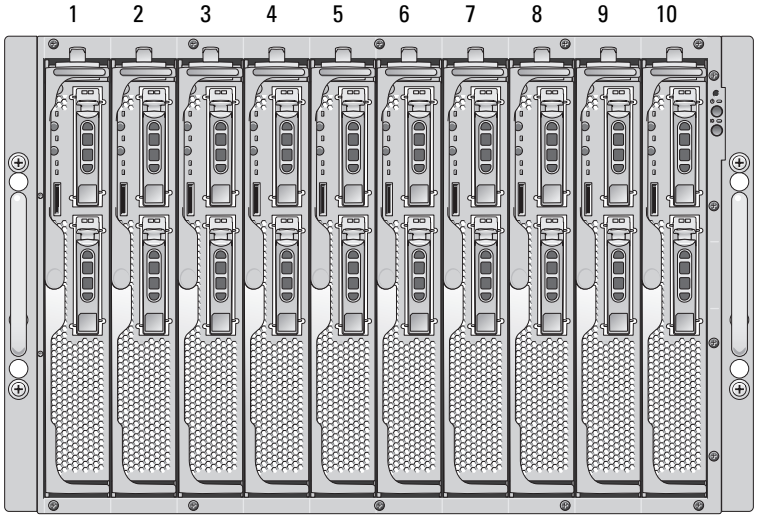
- Release notes or readme files may be included to provide last-minute updates to the system or documentation or advanced technical reference material intended for experienced users or technicians.

System Overview

Your system can include up to ten server modules (or blades) (see Figure 1-1). Each server module functions as an individual server encompassing up to two microprocessors, up to two hot-pluggable hard drives, and up to eight memory modules. To function as a system, a server module is inserted into a chassis that supports power supplies, fan modules, a management module (Dell™ Remote Access Controller/Modular Chassis [DRAC/MC]), a KVM switch module, and at least one I/O module for network connectivity. The power supplies, fans, DRAC/MC, and I/O modules are shared resources of the server modules in the chassis. In addition, your system may also ship with an optional external USB diskette drive and an optional external USB CD drive, which you can use to set up and configure the server modules.

NOTE: To ensure proper operation and cooling, all bays must be populated at all times with either a server module or with a blank.

Figure 1-1. Server Modules

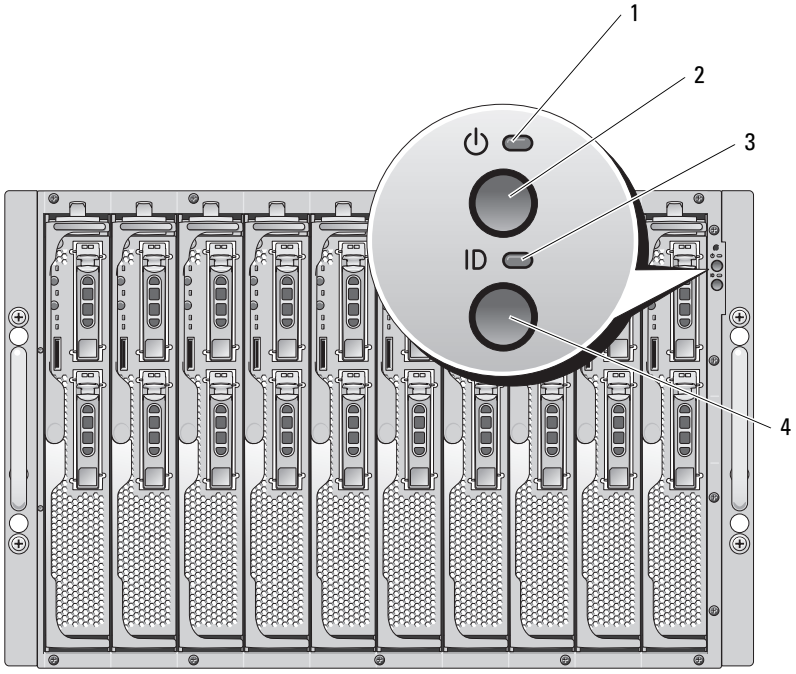


This section describes the major hardware and software features of your system and provides information about the indicators on the system's front and back panels. It also provides information about other documents you may need when setting up your system and how to obtain technical assistance.

System Status Features

The chassis has front-panel control features including power and identification buttons and indicators (see Figure 1-2). Press the power button to turn on the system; press and hold the power button to turn off the system. Pressing the identification button activates the identification indicator on both the front and back (on the KVM module) of the system. Table 1-1 shows the status features.

Figure 1-2. Front-Panel Control and Indicators



1 system power indicator 2 system power button 3 identification indicator

4 identification button

Table 1-1. System Status Features

Indicator Type	Icon	Indicator	Indicator Code
System power button	N/A	None	Turns the system on and off. Press to turn on the system. Press and hold 10 seconds to turn off the system. **NOTE:** The system power button controls power to all of the server modules and I/O modules in the chassis.
System power indicator	⏻	Off	System does not have power.
		Green	System power is on.
		Amber	System is plugged in but is not turned on.
Identification button	N/A	None	Turns on the identification indicators on both the front and back (on the KVM switch module) of the chassis.

Table 1-1. System Status Features *(continued)*

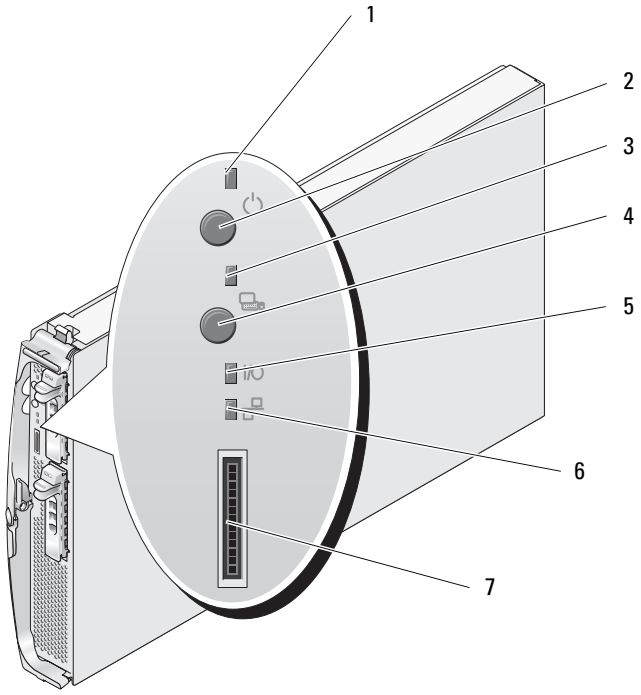
Indicator Type	Icon	Indicator	Indicator Code
Identification indicator	ⓘ	Off	Chassis is not being identified. This is the default.
		Amber, slow blinking	Chassis is being identified. Either the front or back identification button has been pressed. This indicator can be turned off by pressing the identification button.
		Amber, fast blinking	System error. Will stop blinking when the error is resolved.

Server Module Features

Each server module has one power button and one KVM module selection button on the front (see Figure 1-3). The indicators include a power indicator, network link indicators, and a KVM module indicator. The server module also has a custom port on the front of the module. Use the custom cable included with your system to connect this port to two USB devices (for example, USB diskette drive, USB CD drive, USB mouse) and to video.

NOTE: The USB devices can only be connected by using the custom cable supplied with the system.

Figure 1-3. Server Module Indicators



1	server module power indicator	2	server module power button	3	KVM selection indicator
4	KVM selection button	5	daughter card status indicator	6	Ethernet network indicator
7	custom port (with custom cable - USB [2] and video)				

Table 1-2 provides information about the status indicators.

Table 1-2. Server Module Features and Indicators

Indicator	Icon	Activity Indicator	Indicator Code
Server module power indicator		Off	Power is not available to the server module, the server module is not turned on, or the server module is installed incorrectly. For detailed information on installing a server module, see "Server Modules" on page 73.
		Green	The module is turned on.
		Green blinking fast	The module power is on and there is a fault with the server module.
		Green blinking slowly	The module power is on and the server module is being remotely identified via the DRAC/MC.
		Amber	The module power is off, but the system power is on.
		Amber blinking slowly	The module power is off and the server module is being remotely identified via the DRAC/MC.
		Amber blinking fast	The module power is off and there is a fault with the server module.
Server module power button	N/A	None	Turns server module power off and on. • If you turn off the module using the power button and the module is running an ACPI-compliant operating system, the module can perform an orderly shutdown before the power is turned off. • If the module is not running an ACPI-compliant operating system, power is turned off immediately after the power button is pressed. • Press and hold the button to turn off the server module immediately. The button is enabled in the System Setup program. When disabled, you can only use the button to turn on the server module.

Table 1-2. Server Module Features and Indicators *(continued)*

Indicator	Icon	Activity Indicator	Indicator Code
KVM selection indicator		Off	The server module is not selected by the KVM.
		Green	The server module is selected for the KVM.
		Amber blinking	The server module is not selected by the KVM and a power fault exists.
		Green/amber blinking	The server module is selected for the KVM and a power fault exists.
KVM selection button	N/A	None	Selects the server module for use with the KVM located on the back of the system. See "Avocent Analog KVM Switch Module" on page 22 for information on selecting a server module by using the keyboard.
Daughter card status indicator (Infiniband card installed)	I/O	Off	Daughter card is not installed.
		Green	Infiniband daughter card is installed, but no traffic is detected.
		Green blinking	Infiniband daughter card is present and data transfers are occurring.
Daughter card status indicator (Fibre channel daughter card installed)	I/O	Off	Daughter card is not installed.
		Green	A link exists.
		Green blinking	Fibre channel daughter-card data transfers are occurring.
Daughter card status indicator (Gb Ethernet daughter card installed)	I/O	Off	Daughter card is not installed.
		Green	A link exists.
		Green blinking	Gb Ethernet daughter-card data transfers are occurring.
Daughter card status indicator (TOE NIC daughter card installed)	I/O	Off	Daughter card is not installed.
		Green	A link exists.
		Green blinking	TOE NIC daughter card is installed and data transfers are occurring.

Table 1-2. Server Module Features and Indicators *(continued)*

Indicator	Icon	Activity Indicator	Indicator Code
Network indicators		Off	Indicates that the server module does not have a link to the Ethernet switch or pass-through module.
		Green on	Indicates that the server module has a valid link to the network switch module.
		Green blinking	Indicates network activity between the server module and the network switch module. **NOTE:** External network activity is not reported by this indicator. **NOTE:** This network indicator may also blink green due to systems management activity if you use the integrated NIC to remotely access your system's Baseboard Management Controller (BMC). See "Baseboard Management Controller Configuration" on page 54.
USB/video connector		None	Use the custom cable to connect external USB devices and video to the server module.

Using USB Diskette or USB CD Drives

Each server module has a USB port on the front of the server module which allows you to connect a custom cable for a diskette drive or USB CD drive. The USB drives are used to configure the server module.

NOTICE: The system supports only Dell-branded USB 1.1 or USB 2.0 drives. The drive must be horizontal and level to operate properly.

NOTE: If the drive must be designated as the boot drive, connect the USB drive, restart the system, then enter the System Setup Program and set the drive as first in the boot sequence (see "Using the System Setup Program" on page 43). The USB device will be displayed in the boot order setup screen only if it is attached to the system before you run the System Setup program.

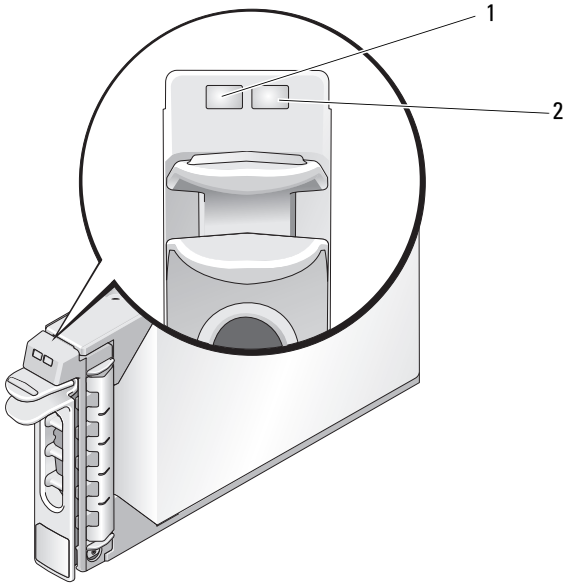
Hard-Drive Features

Each server module supports one or two hot-pluggable SAS hard drives, or one or two hot-pluggable SATA hard drives. See Figure 1-4 and Table 1-3 for information on the hard-drive indicators. Different patterns are displayed as drive events occur in the system.

NOTICE: Each server module must have a hard drive or a hard-drive blank installed in each hard-drive bay.

NOTICE: You cannot install a SAS drive and a SATA drive within a given server module (blade). However, you can install server modules (blades) with SAS drives and server modules with SATA drives in the same server enclosure.

Figure 1-4. Hard-Drive Features and Indicators



1 drive activity indicator 2 drive status indicator

NOTE: The hard-drive status indicator is only functional for RAID hard drive configurations. For non-RAID configurations, only the drive-activity indicator is active.

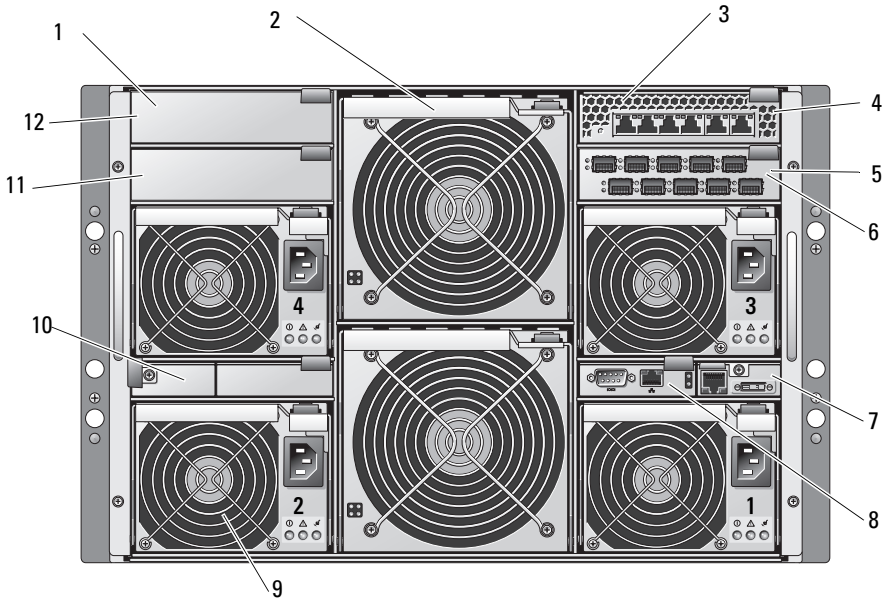
Table 1-3. Hard-Drive Status Indicator Patterns (RAID Configurations Only)

Status Indicator State	Indicator Code
Off	• Drive is ready for removal. • Drive bay is empty. • Power is off to the server module.
Green	Drive is online.
Green, blinking slowly	Drive is rebuilding.
Green, blinking quickly	Drive is being identified.
Amber	Drive has failed or has an error. See "Troubleshooting Hard Drives" on page 113.
Amber blinking slowly, green blinking slowly, then off	The drive has reported a predictive failure event, and should be replaced.

Back-Panel Features

The back of the chassis supports four I/O module bays, the DRAC/MC, fan modules, and power supply modules. Figure 1-5 shows a sample configuration and the numbering for the bays. Table 1-4 provides information about the back-panel features.

Figure 1-5. Back-Panel Features



1	I/O bay 2	2	fan modules (2)	3	PowerConnect 5316M Ethernet switch module
4	I/O bay 1	5	Fibre Channel pass-through module	6	I/O bay 3
7	KVM module	8	DRAC/MC module	9	power supply modules (4)
10	blanks (2)	11	I/O bay 4	12	blanks (2)

Table 1-4. Back-Panel Features and Indicators

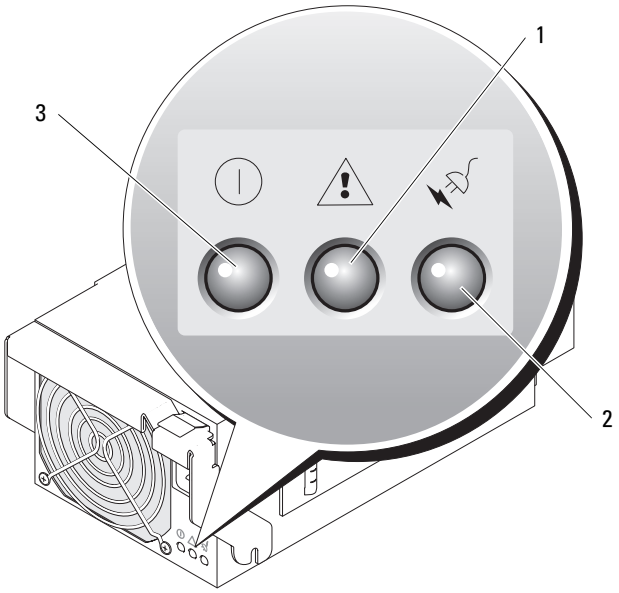
Component	Indicator Description
Power supply modules	Provide information about power status (see "Power Supply Indicator Codes" on page 20).
Fan modules	Provide information about status of the system fans (see "Fan Module Indicators" on page 21).
KVM module	Provides information about the KVM module (see "KVM Modules" on page 22).
DRAC/MC module	Provides information about system status, system management status, and port status (see "DRAC/MC Module" on page 26).
PowerConnect™ 5316M Ethernet switch module	Provides information about the 10/100/1000 BASE-T network status (see "PowerConnect 5316M Ethernet Switch Module" on page 29).
Fibre Channel pass-through module	Provides information about the Fibre Channel network status (see "Fibre Channel Pass-Through Module" on page 31).
Fibre Channel switch module	Provides information about the Fibre Channel network status (see "Fibre Channel Switch Module" on page 32).
Infiniband pass-through module	Provides information about the Infiniband network status (see "Infiniband Pass-through Module" on page 32).
Gb pass-through module	Provides information about the network status (see "Gb Ethernet Pass-through Module" on page 33).

Power Supply Indicator

Each hot-pluggable power supply has indicators that provide information about power status, fault, and the presence of AC power (see Figure 1-6). Table 1-5 lists the power supply indicator codes.

NOTE: Only 2100-W power supply modules are supported on your system. The 2100-W power supply modules require 180–240 V input from a PDU capable of providing AC current up to 29.2 A at 180 V input. If the power supply modules are plugged into 110-V electrical outlets, the system will not power up.

Figure 1-6. Power Supply Indicators



1 fault indicator 2 AC power present indicator 3 DC power indicator

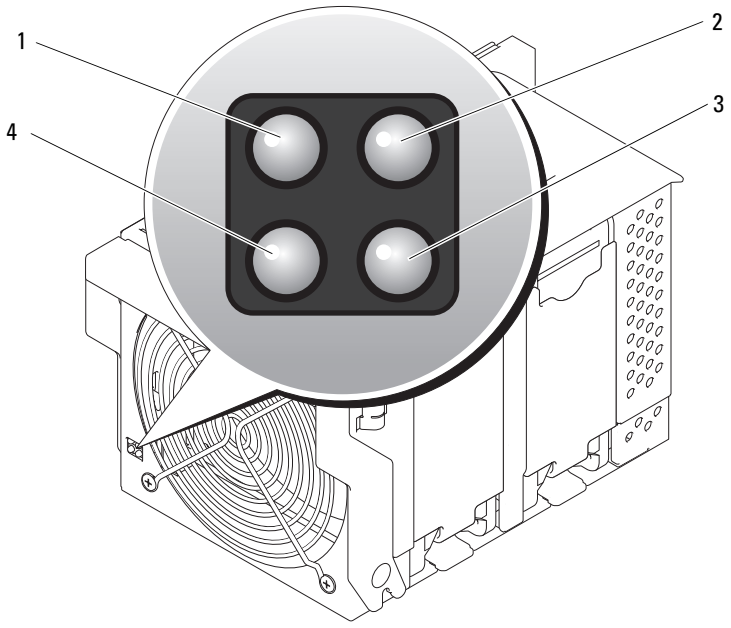
Table 1-5. Power Supply Indicator Codes

Indicator	Icon	Activity Indicator	Indicator Code
DC power indicator		Green	The power supply is operational.
Fault indicator		Amber	The power supply is in a fault condition. The fault condition can result from either a failed power supply or a failed fan within the power supply. See "Power Supply Modules" on page 58.
AC power present indicator		Green	AC power is present at the power supply and the system is connected to an AC power source.

Fan Module Indicators

Each hot-pluggable fan module contains two redundant fans (see Figure 1-7). Table 1-6 lists the fan indicator codes.

Figure 1-7. Fan Module Indicators



1 fan 1 fault indicator 2 fan 1 present indicator 3 fan 2 present indicator

4 fan 2 fault indicator

Table 1-6. Fan Module Indicator Codes

Indicator	Activity Indicator	Indicator Code
Fan 1 present indicator	Off	Fan 1 is not installed.
	Green	Fan 1 is installed.
Fan 1 fault indicator	Off	Fan 1 is operating normally.
	Amber	Fan 1 has failed. See "Fan Modules" on page 59.
Fan 2 present indicator	Off	Fan 2 is not installed.
	Green	Fan 2 is installed.

Table 1-6. Fan Module Indicator Codes *(continued)*

Indicator	Activity Indicator	Indicator Code
Fan 2 fault indicator	Off	Fan 2 is operating normally.
	Amber	Fan 2 has failed. See "Fan Modules" on page 59.

KVM Modules

Your system includes one of the KVM modules described in this section:

- Avocent Analog KVM switch module (standard)
- Avocent Digital Access KVM switch module (optional)

NOTE: Earlier versions of KVM modules are not supported on your system.

Avocent Analog KVM Switch Module

The Avocent Analog KVM switch module provides a custom connection for a keyboard, video (monitor), and mouse to monitor a server module. (You must use the custom cable provided with your system to connect the KVM to the external devices.)

NOTE: Your system has two custom cables—one that connects to the front of the server module to connect two USB devices and video, and a second cable that connects to the KVM to provide two PS/2 connections and a video connection. The cables are not interchangeable. It is recommended that you keep these custom cables available.

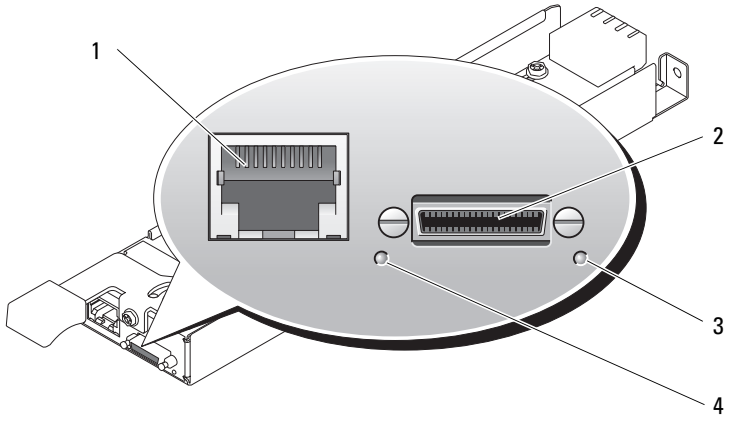
The switch module also provides an Analog Console Interface (ACI) port, which allows you to connect a server module via Cat5 cabling to an external device such as the Dell 2161DS Digital console switch or Dell 180AS/2160AS analog console switches, without the need for a Server Interface Pod (SIP.)

NOTE: Although the ACI port is an RJ-45 connector and uses Cat5 cabling, it is not an Ethernet network interface port. It is only used for connection to external KVM switches with Analog Rack Interface (ARI) ports.

NOTE: The ACI port can only be used to connect to ARI ports on Dell console switches. To connect to other types or brands of switches, including Avocent switches, you must connect to the switch's PS2 and video ports using the proprietary dongle provided with that switch.

Figure 1-8 shows the external features on the Avocent Analog KVM switch module.

Figure 1-8. Avocent Analog KVM Switch Module



1 ACI port

2 custom connector for custom cable (PS/2 [2] and video)

3 identification indicator

4 power indicator

The Avocent Analog KVM switch module also includes an identification indicator (see Figure 1-8). Table 1-7 describes the indicators and features on this switch module.

Table 1-7. Avocent Analog KVM Switch Module Indicators and Features

Feature	Activity Indicator	Indicator Code
Identification indicator	Off	Chassis is not being identified.
	Amber blinking	Chassis is being identified.
Power indicator	Off	KVM switch does not have power.
	Green	KVM switch has power.
Custom connector	None	Allows two PS/2 and one video device to be connected to the system.
ACI port	None	Allows connection of one or more servers to a Dell console switch with an Analog Rack Interface (ARI) port, such as a digital or analog console switch.

Avocent Digital Access KVM Switch Module

The optional Avocent Digital Access KVM switch module allows you to configure and manage the server modules through a single keyboard, monitor and mouse. You select server modules using the On-Screen Configuration and Reporting (OSCAR) graphical user interface (GUI).

The Avocent Digital Access KVM switch module includes the following features:

- Analog KVM switching

  This switch can be used as an Analog switch, allowing local KVM switching through direct connection of a keyboard, monitor and mouse; or tiered into external analog KVM switches. This switch uses the same OSCAR interface as the Avocent Analog KVM switch to switch between server modules.

  The Digital Access KVM switch provides a custom connector which brings out PS2/video ports. These ports can be directly connected to a keyboard, monitor, and mouse, or tiered into an external analog KVM switch with KVM ports. If you are connecting the Digital Access KVM switch to an external KVM switch using Cat5 connectors/ACI ports, that switch's dongle (PS2/video to Cat5) is required.

  NOTE: The Avocent Digital Access KVM module differs from the Avocent Analog KVM module in that the Digital Access KVM switch module does not have an ACI port; it has an Ethernet network interface.

- Remote control of Virtual Media and virtual KVM

  After connecting to your network using the switch's Ethernet connection, use the system's DRAC/MC GUI to select Media and/or console and which server module to connect to.

  NOTE: You must connect the switch's Ethernet port into the same network as the DRAC/MC port.

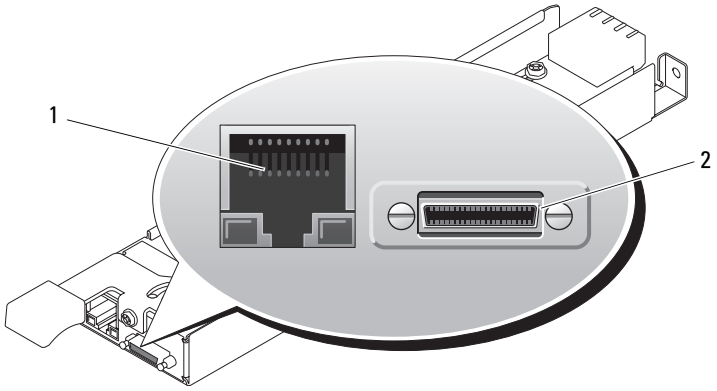
  You can then use the switch's Virtual Media and virtual KVM features:

  – Virtual Media – Using this feature, you can remotely map local drives on a management workstation to the server module, or boot a server module to a remote diskette, optical drive, or USB key. For example, you can remotely perform operating system installation, operating system recovery, BIOS updates, and other functions.

  – Virtual KVM – You can remotely control the server modules from any location, using the digital KVM and an OS-independent graphical console.

Figure 1-9 shows the external features of the Avocent Digital Access KVM switch module.

Figure 1-9. Avocent Digital Access KVM Switch Module

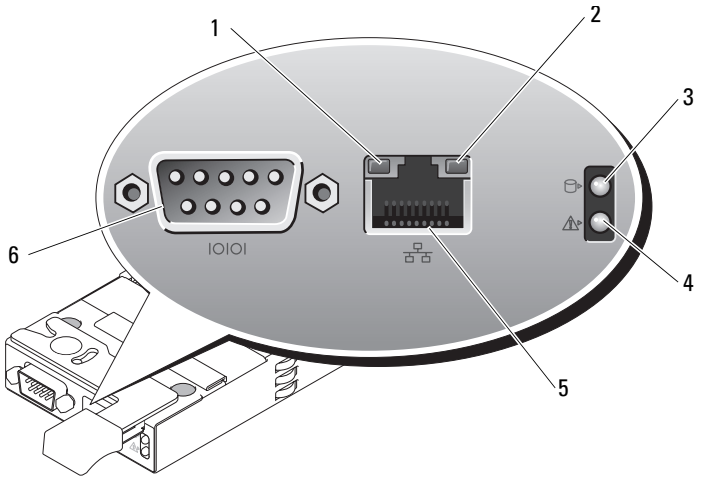


1	RJ-45 connector (Ethernet interface)	2	custom connector (for custom KVM cable - PS/2 [2] and video)

DRAC/MC Module

The DRAC/MC provides serial and Ethernet management ports, a status indicator when redundant DRAC/MCs are installed (when available), and status indicators for the DRAC/MC and for the link to the system's onboard network interface controller (see Figure 1-10). See the documentation for the DRAC/MC module for specific information on serial port redirection of server modules and switches. Table 1-8 provides information about the status indicators.

Figure 1-10. DRAC/MC Module Features



1	link indicator	2	activity indicator	3	primary/secondary indicator
4	fault indicator	5	network interface controller	6	serial connector

Table 1-8. DRAC/MC Module Indicators

Indicator Type	Icon	Activity Indicator	Indicator Code
Network interface controller link indicator		Off	LAN is not linked.
		Green	LAN is linked.
Network interface controller activity indicator		Off	LAN is not active.
		Amber blinking	Indicates that the system DRAC/MC and the LAN are communicating.

Table 1-8. DRAC/MC Module Indicators *(continued)*

Indicator Type	Icon	Activity Indicator	Indicator Code
Primary/secondary indicator		Off	The DRAC/MC is a backup for the master DRAC/MC. **NOTE:** For information on availability of dual (redundant) configurations for the DRAC/MC, see www.dell.com.
		Green	The DRAC/MC is active for system management.
		Green blinking	The DRAC/MC is in special or manufacturing mode.
Fault indicator		Off	The DRAC/MC is operating normally.
		Amber	In a single (nonredundant) configuration, this DRAC/MC failed. See "DRAC/MC Module" on page 61.
		Amber blinking	In a dual (redundant) configuration (when available), this DRAC/MC failed. See "DRAC/MC Module" on page 61.
Serial connector		None	Used for a serial connection with a null modem cable.

Important I/O Configuration Considerations

Insure that you read the DRAC/MC module's **readme.txt** file. It contains updated information, including system indicator behavior in certain conditions.

CAUTION: Data loss can result if you perform certain actions on a system in which the I/O bays have not been configured correctly. Specifically, bay 2 should have an I/O module installed only if a module of the same fabric type is present in bay 1, and bay 4 should have an I/O module installed only if a module of the same fabric type is present in bay 3. Except in these cases (or in a case where you temporarily need to swap a failed I/O module in bay 1 or 3), bays 2 and 4 should be unoccupied.

Unless your system is configured according to these guidelines, do not perform any of the following actions:

- **Upgrade DRAC/MC firmware**
- **Issue a software reset command for a DRAC/MC, such as racadm racreset**
- **Reseat a DRAC/MC module**
- **Cause a DRAC/MC failover event, such as removing the network cable from the primary DRAC/MC, or rebooting a switch that the DRAC/MC cable is connected to**

Performing any of these actions will power off and stop traffic on the bay 2 or bay 4 I/O module, resulting in data loss.

When initiated, the DRAC/MC firmware algorithm must find a module in bay 1 before bay 2 and a module in bay 3 before bay 4. Otherwise, the module in bay 2 or bay 4 will be powered off if you perform a firmware upgrade procedure on the DRAC/MC, cause a DRAC/MC failover, or reset the DRAC/MC.

See the current *Dell Remote Access Controller/Modular Chassis User's Guide* at **support.dell.com** for more information about configuring your DRAC/MC system.

DRAC/MC Firmware Requirements

The minimum DRAC/MC firmware requirement for your system is version 1.3 or later. If you are adding a second DRAC/MC module with version 1.0 to support redundancy, you must upgrade the module's firmware to version 1.1, then upgrade the firmware to version 1.3 (or later).

NOTE: A DRAC/MC module's firmware version is displayed on its web-based GUI or by typing the command `getsysinfo` or `racadm getsysinfo`.

See the latest *Dell Remote Access Controller/Modular Chassis User's Guide* at **support.dell.com** for more information about firmware updates and installing redundant DRAC/MC modules. This guide also provides complete instructions on how to set up and operate that version of the module.

I/O Connectivity

The system offers several options for connectivity through a combination of embedded Ethernet controllers, optional I/O daughter cards on the server module, and chassis I/O modules in the rear of the chassis. An I/O module's green system/diagnostic indicator is off when the module is properly operating or is off and blinks when the module is not properly operating.

Guidelines for Installing Connectivity Modules

The following guidelines must be used when populating I/O modules. See Figure 1-5 for I/O bay locations.

- Insert a connectivity module into I/O bay 1 before installing a connectivity module into I/O bay 2.

  Ensure that the connectivity modules installed in I/O bays 1 and 2 are of the same fabric type.
- Insert a connectivity module into I/O bay 3 before installing a connectivity module into I/O bay 4.

  Ensure that the connectivity modules installed in I/O bays 3 and 4 are of the same fabric type.
- I/O bay 3 connects to port 1 on the daughter card (optional) installed in the server module.
  - This bay must be populated if there is a daughter card installed in the server module.
  - The type of I/O module installed in this bay must match the type of daughter card installed in the server module. For example, a Fibre Channel I/O module requires that a Fibre Channel daughter card be installed in the server module.

Table 1-9 lists the valid I/O module configurations. See Figure 1-5 for I/O bay locations.

Table 1-9. Valid I/O Module Configurations

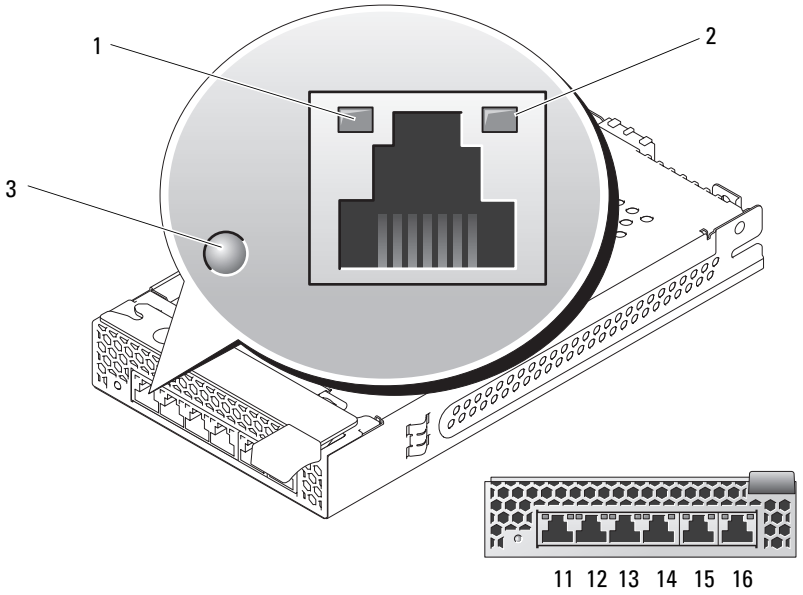
Network Controller	Bay IO/1	Bay IO/2	Bay IO/3	Bay IO/4
Server Module Embedded NIC 1	Ethernet switch module or pass-through module	N/A	N/A	N/A
Server Module Embedded NIC 2	N/A	Ethernet switch module or pass-through module	N/A	N/A
Fibre Channel Daughter Card Port 1	N/A	N/A	Fibre channel switch or pass-through module	N/A
Fibre Channel Daughter Card Port 2	N/A	N/A	N/A	Fibre channel switch or pass-through module
Gb Ethernet Daughter Card Port 1	N/A	N/A	Ethernet switch module or pass-through module	
Gb Ethernet Daughter Card Port 2	N/A	N/A		Ethernet switch module or pass-through module
Infiniband Daughter Card	N/A	N/A	Infiniband module (either or both bays)	Infiniband module (either or both bays)

PowerConnect 5316M Ethernet Switch Module

The PowerConnect 5316M Ethernet switch module is a 16-port switch with 6 uplinks and 10 downlinks (see Figure 1-11). The uplinks connect to the external Ethernet network and operate at 1/2/4 Gb. The downlinks connect to the embedded Ethernet controller on the server module and operate at 1 Gb only.

The PowerConnect 5316M Ethernet switch module is hot-pluggable. To provide connectivity into separate Ethernet networks, two switch modules can be installed in bays I/O 1 and I/O 2 (see Figure 1-5). I/O bays 3 and 4 require that you install a Gb Ethernet daughter card in the server module. If redundancy is not required, the switch module must be installed in I/O 1 bay. The switch module has an internal serial port that communicates with the DRAC/MC module. Table 1-10 lists the indicators on each switch module. For additional information about the PowerConnect 5316M Ethernet switch module, see the documentation that shipped with the module.

Figure 1-11. PowerConnect 5316M Ethernet Switch Module Indicators and Features



1 speed/link activity indicator 2 duplex mode indicator 3 system/diagnostic indicator

Table 1-10. PowerConnect 5316M Ethernet Switch Module Indicators

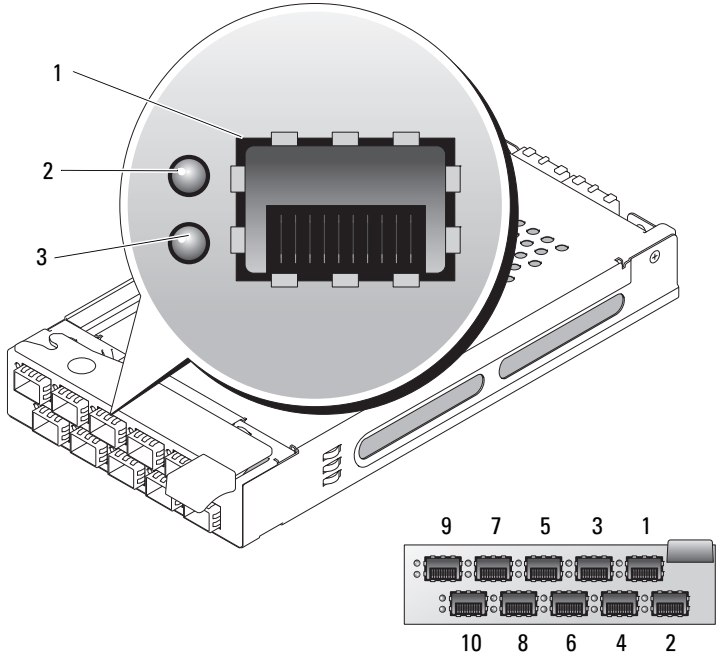
Indicator Type	Activity Indicator	Indicator Code
Speed/link activity indicator (bicolor)	Off	Not connected.
	Green	The port is connected to a valid link partner on the network.
	Green blinking	Network data is being sent or received at 1 Gb.
	Amber	The port is connected to a valid link partner on the network.
	Amber blinking	Network data is being sent or received at 10 Mb or 100 Mb.
Duplex mode indicator	Green	The port is operating at full duplex mode.
	Off	The port is operating at half duplex mode.
System/diagnostic indicator	Green blinking	Module is being powered down by the DRAC/MC controller due to an I/O module mismatch. See "Guidelines for Installing Connectivity Modules" on page 28.
	Off	Module is operating normally.

Fibre Channel Pass-Through Module

The Fibre Channel pass-through module provides a bypass connection between the Fibre Channel daughter card in the server module and optical transceivers for direct connection into a Fibre Channel switch or a storage array. (see Figure 1-12). The Fibre Channel pass-through modules are hot-pluggable. The Fibre Channel pass-through module in I/O bay 3 connects to port 1 on the optional Fibre Channel daughter card installed in a server module. The Fibre Channel pass-through module in I/O bay 4 connects to port 2 on the optional Fibre Channel daughter card installed in a server module. To provide redundancy, both I/O bay 3 and I/O bay 4 must have Fibre Channel pass-through modules installed. Table 1-11 lists the functionality of the Fibre Channel pass-through module indicators. For additional information on installing this module, see "Chassis I/O Module" on page 70.

NOTE: The Fibre Channel pass-through module includes Short Wave Small Form Factor Pluggable (SFP) optical transceivers. To ensure proper functionality, use only the SFPs provided with this module.

Figure 1-12. Fibre Channel Pass-through Module Indicators and Features



1 SFP Fibre Channel connector 2 green indicator 3 amber indicator

Table 1-11. Fibre Channel Pass-Through Module Indicators

Indicator Type	Activity Indicator	Indicator Code
Fibre Channel indicator (green/amber)	Off	Power is off to the system.
	Green/amber	System has power.
	Green/off	Fibre Channel connection is online.
	Off/amber	The port is connected to a valid link partner on the network.
	Off/flashing (twice per second)	Connection has lost synchronization.

Fibre Channel Switch Module

You can install one or two hot-pluggable Fibre Channel switch modules in I/O bay 3 and I/O bay 4, beginning with I/O bay 3. You must also install a Fibre Channel HBA daughter card in the server module. The Fibre Channel switch module includes four external autosensing Fibre Channel ports numbered 10 through 13, 10 internal ports, and one Ethernet port with an RJ-45 connector. All the external ports operate at 1 Gb/sec, 2 Gb/sec, or 4 Gb/sec.

See the documentation for your particular Fibre Channel switch module for the functionality and location of the switch module indicators. For general information on installing this module, see "Chassis I/O Module" on page 70.

NOTE: The Fibre Channel switch module includes Short Wave Small Form Factor Pluggable (SFP) optical transceivers. To ensure proper functionality, use only SFPs provided with this module.

Infiniband Pass-through Module

The Infiniband pass-through module provides a bypass connection between an optional Infiniband Host Channel Adapter (HCA) daughter card in the server module and 4x Infiniband Transceivers for direct connection to an Infiniband switch. The Infiniband pass-through modules are hot-pluggable. To provide redundancy, both I/O bay 3 and I/O bay 4 must have Infiniband pass-through modules installed. In this configuration, the module in I/O bay 3 connects to port 1 on the Infiniband HCA daughter card; the Infiniband pass-through module in I/O bay 4 connects to port 2 on the Infiniband HCA daughter card.

NOTE: The Infiniband pass-through module uses small form factor 4x Infiniband connectors. To ensure proper functionality, use only cables provided with the module.

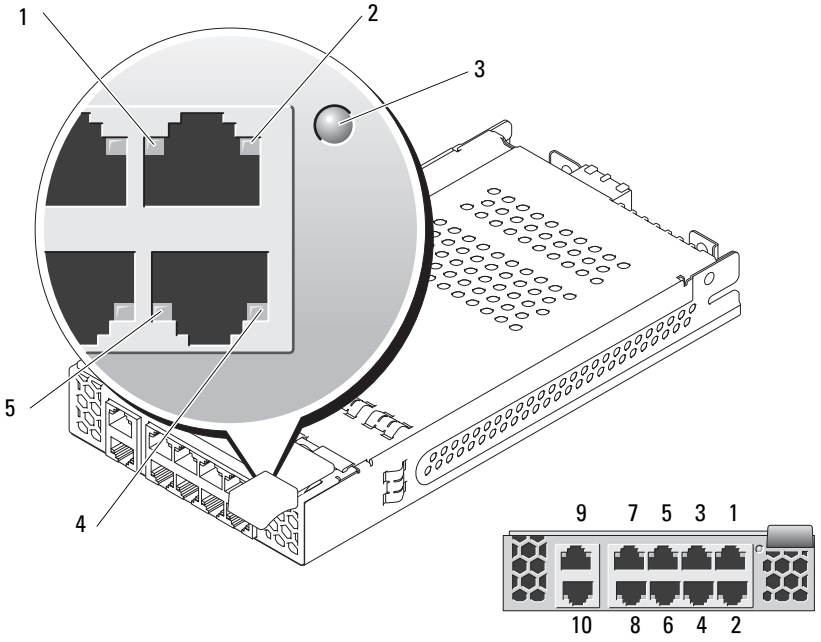
NOTE: If you require service, technical support, or parts replacement for your Topspin Infiniband product, contact Topspin Support Services directly at 1-800-499-1473 or through www.topspin.com.

Gb Ethernet Pass-through Module

The Gb Ethernet pass-through module has 10 RJ45 ports. When installed in I/O 1 bay or I/O 2 bay, the Gb Ethernet pass-through module provides a connection between the server module and an external Gb Ethernet device. When installed in the I/O 3 bay or I/O 4 bay, the Gb Ethernet pass-through module provides a connection between the optional internal Gb Ethernet daughter card in the server module, providing a direct connection into an external Gb Ethernet device (see Figure 1-13). The Gb Ethernet pass-through modules are hot-pluggable. The Gb Ethernet pass-through module in I/O bay 3 connects to the optional Gb Ethernet daughter card installed in a server module. The Gb Ethernet pass-through module in I/O bay 4 connects to port 2 on the optional Gb Ethernet daughter card installed in a server module. Table 1-12 lists the functionality of the Gb Ethernet pass-through module indicators. For additional information on installing this module, see "Chassis I/O Module" on page 70.

NOTE: Only connect the Gb Ethernet module to 1000-Mb external switch ports. Do not use this module with 10-Mb or 100-Mb external switch ports.

Figure 1-13. Gb Pass-through Module Indicators and Features



1	activity indicator	2	link indicator	3	status indicator
4	link indicator	5	activity indicator		

NOTE: Connectors on the Gb pass-through module correspond directly to the server module number. For example, server module 5 is connected to port 5 on the Gb pass-through module.

Table 1-12. Gb Pass-through Module Indicators

Indicator Type	Activity Indicator	Indicator Code
Link indicator/activity indicator	Green/amber blinking	The Gb Ethernet connector is linked to the server module and there is network activity
	Green/off	The Gb Ethernet connector is linked to the server module and there is no network activity.
	Off/amber blinking	The Gb Ethernet connector is not linked to the server module and there is network activity.
	Off/off	The Gb Ethernet connector is not linked to the server module and there is no network activity.
Status indicator	Green	Module is operating correctly.
	Green blinking	Module is being powered down by the DRAC/MC controller due to an I/O module mismatch. See "Guidelines for Installing Connectivity Modules" on page 28.

Server Module Messages

System messages appear on the screen to notify you of a possible problem with the system. Table 1-13 lists the system messages that can occur and the probable cause and corrective action for each message.

CAUTION: Many repairs may only be done by a certified service technician. You should only perform troubleshooting and simple repairs as authorized in your product documentation, or as directed by the online or telephone service and support team. Damage due to servicing that is not authorized by Dell is not covered by your warranty. Read and follow the safety instructions that came with the product.

NOTE: If you receive a system message that is not listed in Table 1-13, check the documentation for the application that is running when the message appears or the operating system's documentation for an explanation of the message and recommended action.

Table 1-13. Server Module Messages

Message	Causes	Corrective Actions
`Alert: DIMM_n and DIMM_n must be populated with a matched set of DIMMs if more than 1 DIMM is present. The following memory DIMMs have been disabled:`		Ensure that the memory modules are installed in matched pairs. See "General Memory Module Installation Guidelines" on page 78.
`Alert! Redundant memory disabled!. Memory configuration does not support redundant memory`	The installed memory configuration does not support redundant memory.	Install a memory configuration that supports redundant memory. See "General Memory Module Installation Guidelines" on page 78. Disable the **Redundant Memory** option in the System Setup program. See "Using the System Setup Program" on page 43.
`Alert! Unsupported memory, incomplete sets, or unmatched sets. The following memory DIMMs have been disabled:`	The installed memory configuration is invalid.	Add, move, or remove memory modules to achieve a configuration supported by the system. See "General Memory Module Installation Guidelines" on page 78.
`Caution! NVRAM_CLR jumper is installed on system board.`	NVRAM_CLR switch is set to "on."	Set the NVRAM_CLR switch to "off." See Figure 6-2 for the jumper location.
`CPUs with different cache sizes detected.`	Mismatched processors are installed.	Install a correct version of the microprocessor so that both microprocessors have the same cache size. See "Processors" on page 84.
`Decreasing available memory`	Faulty or improperly installed memory modules.	Ensure that all memory modules are properly installed. See "Troubleshooting Server Module Memory" on page 112.
`DIMMs should be installed in pairs. Pairs must be matched in size, speed, and technology.`	Mismatched or unmatched DIMMs installed; faulty or improperly installed memory modules. The system will operate in a degraded mode with reduced ECC protection. Only memory installed in channel 0 will be accessible.	Ensure that all pairs of memory modules are of the same type and size and that they are properly installed. See "General Memory Module Installation Guidelines" on page 78. If the problem persists, see "Troubleshooting Server Module Memory" on page 112.

Table 1-13. Server Module Messages *(continued)*

Message	Causes	Corrective Actions
DIMMs must be populated in sequential order beginning with slot 1. The following DIMM is electrically isolated: DIMM *x*.	The specified DIMM is inaccessible to the system due to its location. DIMMs must be populated in sequential order, beginning with slot 1.	Populate two, four, or eight DIMMs sequentially beginning with slot 1.
DIMM pairs must be matched in size, speed, and technology. The following DIMM pair is mismatched: DIMM *x* and DIMM *y*.	Mismatched or unmatched DIMMs installed; faulty or improperly seated memory modules.	Ensure that all pairs of memory modules are of the same type and size, and that they are properly installed. See "General Memory Module Installation Guidelines" on page 78. See "Troubleshooting Server Module Memory" on page 112.
Diskette drive *n* seek failure	Incorrect configuration settings in System Setup program.	Run the System Setup program to correct the settings. See "Using the System Setup Program" on page 43.
	Faulty or improperly connected diskette or optical drive to the custom cable.	Replace the diskette. Ensure that the diskette drive and optical drive cables are properly connected. See "Troubleshooting USB Devices" on page 105.
Diskette read failure	Faulty or improperly inserted diskette.	Replace the diskette.
Diskette subsystem reset failed	Faulty diskette drive or optical drive controller.	Ensure that the diskette drive and optical drive cables are properly connected to the custom cable. See "Troubleshooting USB Devices" on page 105. If the problem persists, see "Getting Help" on page 127.
Drive not ready	Diskette missing or improperly inserted in diskette drive.	Reinsert or replace the diskette.
Error: Incorrect memory configuration. DIMMs must be installed in pairs of matched memory size, speed, and technology.	Mismatched or unmatched DIMMs installed; faulty or improperly seated memory modules.	Ensure that all pairs of memory modules are of the same type and size, and that they are properly installed. See "General Memory Module Installation Guidelines" on page 78. If the problem persists, see "Troubleshooting Server Module Memory" on page 112.

Table 1-13. Server Module Messages *(continued)*

Message	Causes	Corrective Actions
`Error: Memory failure detected. Memory size reduced. Replace the faulty DIMM as soon as possible.`	Faulty or improperly seated memory modules.	See "Troubleshooting Server Module Memory" on page 112.
`Error: Remote Access Controller initialization failure.`	Faulty or improperly installed DRAC/MC module.	Reinstall the DRAC/MC module. See "DRAC/MC Module" on page 26. If the problem persists, replace the DRAC/MC module.
`FBD training error: The following branch has been disabled: Branch` *x*`.`	The specified branch (channel pair) contains DIMMs that are incompatible with each other.	Ensure that only Dell qualified memory is used. Dell recommends purchasing memory upgrade kits directly from http://www.dell.com or your Dell sales agent to ensure compatibility.
`Gate A20 failure`	Faulty keyboard controller (faulty server module board).	See "Getting Help" on page 127.
`General failure`	Operating system corrupted or improperly installed.	Reinstall the operating system.
`Keyboard controller failure`	Faulty keyboard controller (faulty server module board).	See "Getting Help" on page 127.

`Keyboard data line failure`
`Keyboard failure`
`Keyboard stuck key failure`
	Loose or improperly connected keyboard cable; faulty keyboard to the custom cable; faulty keyboard controller.	Ensure that the keyboard is properly connected. If the problem persists, replace the keyboard.
		If the message still appears, the keyboard controller is faulty. See "Getting Help" on page 127.

`Manufacturing mode detected`	System is incorrectly configured.	Set the NVRAM_CLR switch to "on" and reboot the server module. See Figure 6-2 for switch location.

Table 1-13. Server Module Messages *(continued)*

Message	Causes	Corrective Actions
Memory address line failure at *address*, read *value* expecting *value* Memory double word logic failure at *address*, read *value* expecting *value* Memory odd/even logic failure at *start address* to *end address* Memory write/read failure at *address*, read *value* expecting *value*	Faulty or improperly installed memory modules, or faulty server module board.	Ensure that all memory modules are properly installed. See "Troubleshooting Server Module Memory" on page 112. If the problem persists, see "Getting Help" on page 127.
Memory mirroring enabled	Memory mirroring enabled	Information only.
Memory tests terminated by keystroke	The spacebar was pressed during POST to terminate the memory test.	Information only.
No boot device available	Faulty or missing diskette drive, optical drive, or hard drive.	Check the **Integrated Devices** configuration settings in the System Setup program and ensure that the controller for the boot device is enabled. See "Using the System Setup Program" on page 43. Ensure that the controller for the boot device is enabled. If the problem persists, replace the drive. See "Hard Drives" on page 89.
No boot sector on hard-disk drive	An operating system is not on the hard drive.	Check the hard-drive configuration settings in the System Setup program. See "Using the System Setup Program" on page 43.
No timer tick interrupt	Faulty server module board.	See "Getting Help" on page 127.
Not a boot diskette	Not a bootable diskette.	Use a bootable diskette.
PCI BIOS failed to install	Faulty or improperly installed.	Reseat the daughter card. See "I/O Module Daughter Card" on page 82. If the problem persists, see "Getting Help" on page 127.

Table 1-13. Server Module Messages *(continued)*

Message	Causes	Corrective Actions
`Plug & Play Configuration Error`	Error encountered in initializing PCI device; faulty server module board.	Set the NVRAM_CLR switch to "on" and reboot the server module. See Figure 6-2 for switch location. Check for a BIOS update. If the problem persists, see "Getting Help" on page 127.
`Read fault`	Faulty diskette, diskette drive, optical drive, or hard drive.	Replace the diskette. Ensure that the custom cable is properly connected. See "Troubleshooting USB Devices" on page 105 or "Troubleshooting Hard Drives" on page 113. for the appropriate drive(s) installed in your system.
`Remote Configuration update attempt failed`	Server module could not implement Remote Configuration request.	Retry Remote Configuration.

`Sector not found`
`Seek error`
`Seek operation failed`
	Faulty diskette or hard drive.	Replace the diskette. If the problem persists, see "Troubleshooting Hard Drives" on page 113 for the appropriate drive installed in your system.

`Shutdown failure`	Shutdown test failure.	Ensure that all memory modules are properly installed. See "Troubleshooting Server Module Memory" on page 112. If the problem persists, see "Getting Help" on page 127.
`Spare bank enabled`	Memory sparing enabled.	Information only.
`The amount of system memory has changed.`	Faulty memory module. Information only, if you have changed the memory configuration.	See "Troubleshooting Server Module Memory" on page 112. If the problem persists, see "Getting Help" on page 127.
`Time-of-day clock stopped`	Faulty battery; faulty server module board.	See "Troubleshooting Server Module Memory" on page 112. If the problem persists, see "Getting Help" on page 127.
`Time-of-day not set - please run SETUP program`	Incorrect **Time** or **Date** settings; faulty server module board battery.	Check the **Time** and **Date** settings. See "Using the System Setup Program" on page 43. If the problem persists, see "Troubleshooting the Server Module Battery" on page 115.
`Timer chip counter 2 failed`	Faulty server module board.	See "Getting Help" on page 127.

Table 1-13. Server Module Messages *(continued)*

Message	Causes	Corrective Actions
`Unsupported CPU combination`	Mismatched processors are installed. Processor is not supported by the server module.	Replace a microprocessor so that both microprocessors match. See "Processors" on page 84. Check for a BIOS update using the Dell Support website at **support.dell.com**.
`Unsupported CPU stepping detected`	Processor is not supported by the server module.	Check for a BIOS update using the Dell Support website at **support.dell.com**. If the problem persists, install a supported processor. See "Processors" on page 84.
`Warning! No microcode update loaded for processor n`	Unsupported processor.	Update the BIOS firmware using the Dell Support website at **support.dell.com**.
`Warning: The current memory configuration is not validated. Change it to the recommended memory configuration or press any key to continue.`	There is no memory configuration error, but the memory configuration is not recommended by Dell.	See "General Memory Module Installation Guidelines" on page 78.
`Write fault` `Write fault on selected drive`	Faulty diskette, diskette drive, optical drive, hard drive.	Replace the diskette. Ensure that the custom cable is properly connected. See "Troubleshooting USB Devices" on page 105 or "Troubleshooting Hard Drives" on page 113 for the appropriate drive(s) installed in your system.

Warning Messages

A warning message alerts you to a possible problem and prompts you to respond before the system continues a task. For example, before you format a diskette, a message will warn you that you may lose all data on the diskette. Warning messages usually interrupt the task and require you to respond by typing `y` (yes) or `n` (no).

NOTE: Warning messages are generated by either the application or the operating system. For more information, see the documentation that accompanied the operating system or application.

Diagnostics Messages

When you run system diagnostics, an error message may result. Diagnostic error messages are not covered in this section. Record the message on a copy of the Diagnostics Checklist in "Getting Help," then follow the instructions in that section for obtaining technical assistance.

Alert Messages

Systems management software generates alert messages for your system. Alert messages include information, status, warning, and failure messages for drive, temperature, fan, and power conditions. For more information, see the systems management software documentation.

2

Using the System Setup Program

After you set up your system, run the System Setup program to familiarize yourself with your system configuration and optional settings. Record the information for future reference.

You can use the System Setup program to:

- Change the system configuration stored in NVRAM after you add, change, or remove hardware
- Set or change user-selectable options—for example, the time or date
- Enable or disable integrated devices
- Correct discrepancies between the installed hardware and configuration settings

NOTE: When a server module is inserted into a chassis, the server module functions as a system. Each server module has a System Setup program to allow configuration of the server module and features such as password protection.

Entering the System Setup Program

1. Turn on or restart your system.
2. Press <F2> immediately after you see the following message:

   ```
   <F2> = Setup
   ```

   If your operating system begins to load before you press <F2>, allow the system to finish booting, and then restart your system and try again.

   NOTE: To ensure an orderly system shutdown, see the documentation that accompanied your operating system.

Responding to Error Messages

You can enter the System Setup program by responding to certain error messages. If an error message appears while the system is booting, make a note of the message. Before entering the System Setup program, "Server Module Messages" on page 34 and "Warning Messages" on page 40 for an explanation of the message and suggestions for correcting errors.

NOTE: After installing a memory upgrade, it is normal for your system to send a message the first time you start your system.

Using the System Setup Program

Table 2-1 lists the keys that you use to view or change information on the System Setup program screens and to exit the program.

Table 2-1. System Setup Program Navigation Keys

Keys	Action
Up arrow or <Shift><Tab>	Moves to the previous field.
Down arrow or <Tab>	Moves to the next field.
Spacebar, <+>, <–>, left and right arrows	Cycles through the settings in a field. In some fields, you can also type the appropriate value.
<Esc>	Exits the System Setup program and restarts the system if any changes were made.
<F1>	Displays the System Setup program's help file.

NOTE: For most of the options, any changes that you make are recorded but do not take effect until you restart the system.

System Setup Options

Main Screen

When you enter the System Setup program, the main System Setup program screen appears (see Figure 2-1).

Figure 2-1. Main System Setup Program Screen

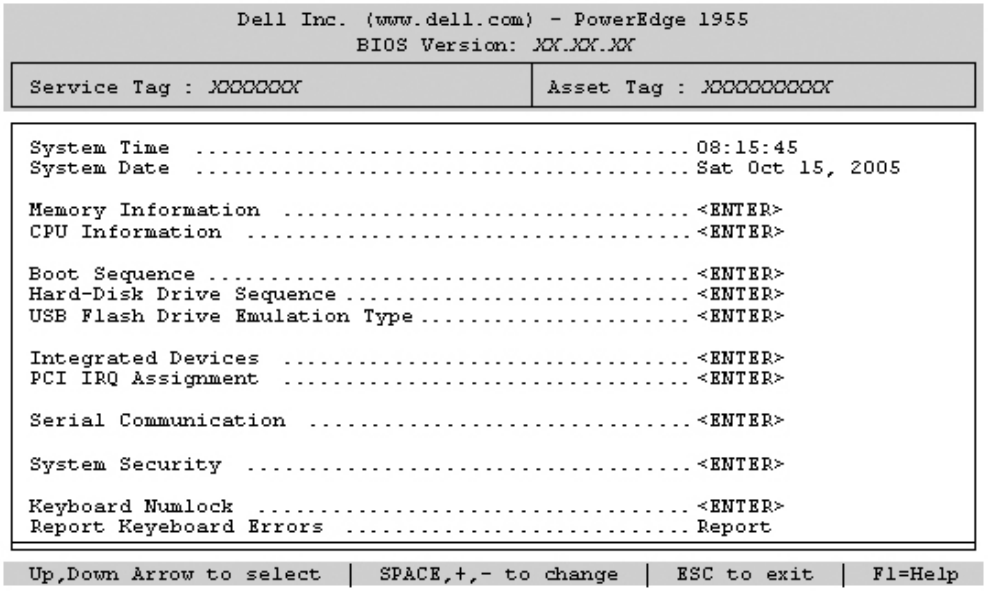


Table 2-2 lists the options and descriptions for the information fields that appear on the main System Setup program screen.

NOTE: The options for the System Setup program change based on the system configuration.

NOTE: The System Setup program defaults are listed under their respective options, where applicable.

Table 2-2. System Setup Program Options

Option	Description
Asset Tag	Displays the customer-programmable asset tag number for the system if an asset tag number has been assigned. To enter an asset tag number of up to 10 characters into NVRAM, see "Acquiring the asset.com Utility" on page 54.
System Time	Resets the time on the system's internal clock.
System Date	Resets the date on the system's internal calendar.
Memory Information	See "Memory Information Screen" on page 47.
CPU Information	See "CPU Information Screen" on page 47.

Table 2-2. System Setup Program Options *(continued)*

Option	Description
Boot Sequence	Determines the order in which the system searches for boot devices during system startup. Available options can include the USB diskette drive, USB CD drive, hard drives, and USB flash drive. **NOTE:** A USB device will be displayed in the boot order screen only if it is attached to the system before the system enters BIOS.
Hard-Disk Drive Sequence	Determines the order in which the system searches the hard drives during system startup. The selections depend on the hard drives installed in your system.
USB Flash Drive Emulation Type (**Auto** default)	Determines the emulation type for a USB flash drive. **Hard disk** allows the USB flash drive to act as a hard drive. **Floppy** allows the USB flash drive to act as a removable diskette drive. **Auto** automatically chooses an emulation type.
Integrated Devices	See "Integrated Devices Screen" on page 48.
PCI IRQ Assignment	Displays a screen to change the IRQ assigned to each of the integrated devices on the PCI bus, and any installed expansion cards that require an IRQ.
Serial Communication	See "Serial Communication Screen" on page 49.
System Security	Displays a screen to configure the system password and setup password features. See "Using the System Password" on page 51 and "Using the Setup Password" on page 53 for more information.
Keyboard NumLock (**On** default)	Determines whether your system starts up with the NumLock mode activated on 101- or 102-key keyboards (does not apply to 84-key keyboards).
Report Keyboard Errors (**Report** default)	Enables or disables reporting of keyboard errors during the POST. Select **Report** for host systems that have keyboards attached. Select **Do Not Report** to suppress all error messages relating to the keyboard or keyboard controller during POST. This setting does not affect the operation of the keyboard itself if a keyboard is attached to the system.

Memory Information Screen

Table 2-3 lists the options and descriptions for the information fields that appear on the **Memory Information** screen.

Table 2-3. Memory Information Screen

Option	Description
System Memory Size	Displays the amount of main memory. (If memory mirroring or spare memory is enabled, this value will be less than the amount of physical memory installed in the server module.) This field does not have user-selectable settings.
System Memory Type	Displays the type of system memory. This field does not have user-selectable settings.
System Memory Speed	Displays the system memory clock frequency. This field does not have user-selectable settings.
Video Memory	Displays the amount of video memory. This field does not have user-selectable settings.
System Memory Testing (**Enabled** default)	Determines if memory is being tested during POST. Setting this value to **Enabled** will affect the duration of system POST.
Redundant Memory	If a valid memory configuration is installed, you can enable memory mirroring or spare memory. Options are **Mirror Mode**, **Spare Mode**, and **Disabled**. See "Memory" on page 77.

CPU Information Screen

Table 2-4 lists the options and descriptions for the information fields that appear on the **CPU Information** screen.

Table 2-4. CPU Information Screen

Option	Description
64-bit	Displays the processor register width.
Core Speed	Displays the core speed of the processors.
Bus Speed	Displays the bus speed of the processors.
Logical Processor (**Enabled** default)	Displays when the processors support HyperThreading. **Enabled** permits all logical processors to be used by the operating system. Only the first logical processor of each processor installed in the system is used by the operating system if **Disabled** is selected.
Virtualization Technology (**Enabled** default)	Enables or disables features associated with the processor's Virtualization Technology.

Table 2-4. CPU Information Screen *(continued)*

Option	Description
Adjacent Cache Line Prefetch (**Enabled** default)	Enables or disables optimal use of sequential memory access. **Enabled** optimizes the system for applications that require sequential memory access. **Disabled** is used for applications with random memory access.
Hardware Prefetcher (**Enabled** default)	Enables or disables the hardware prefetcher.
Demand-Based Power Management (**Disabled** default)	Enables the operating system to regulate processor power usage based on load.
Processor X ID	Displays the family and model number of each processor. A submenu displays the core speed, the amount of cache memory, and the number of cores of the processor(s)

Integrated Devices Screen

Table 2-5 lists the options and descriptions for the information fields that appear on the **Integrated Devices** screen.

Table 2-5. Integrated Devices Screen Options

Option	Description
Embedded SAS Controller (**Enabled** default)	Enables the integrated SAS controller.
User Accessible USB Ports (**All Ports On** default)	Enables or disables the system's USB ports. Options are **All Ports On** or **All Ports Off**. Disabling the USB ports makes system resources available for other devices.
Embedded Gb NIC1 (**Enabled without PXE** default)	Enables or disables the system's integrated NIC. Changes take effect after the system reboots.
MAC Address	Displays the MAC address for NIC1. This field does not have user-selectable settings.
TOE Capability	Displays status of the TCP/IP off-load engine (TOE) feature of NIC1. See "Activating the Integrated NIC TOE" on page 84. **NOTE:** To use the TOE feature in a NIC team, a dual-port TOE hardware key is required.
Embedded Gb NIC2 (**Enabled with PXE** default)	Enables or disables the system's integrated NIC. Changes take effect after the system reboots.

Table 2-5. Integrated Devices Screen Options *(continued)*

Option	Description
MAC Address	Displays the MAC address for NIC2. This field does not have user-selectable settings.
TOE Capability	Displays status of the TCP/IP off-load engine (TOE) feature of NIC2. See "Activating the Integrated NIC TOE" on page 84. **NOTE:** To use the TOE feature in a NIC team, a dual-port TOE hardware key is required.

Serial Communication Screen

Table 2-6 lists the options and descriptions for the information fields that appear on the **Serial Communication** screen.

Table 2-6. Serial Communication Screen Options

Option	Description
Serial Communication (**Off** default)	Options are **On with Console Redirection** via COM2, and **Off**.
Failsafe Baud Rate (**115200** default)	Displays the failsafe baud rate used for console redirection when the baud rate cannot be negotiated automatically with the remote terminal. This rate should not be adjusted.
Remote Terminal Type (**VT 100/VT 220** default)	Select either **VT 100/VT 220** or **ANSI**.
Redirection After Boot (**Enabled** default)	Enables or disables BIOS console redirection after your system boots to the operating system.

System Security Screen

Table 2-7 lists the options and descriptions for the information fields that appear on the **System Security** screen.

Table 2-7. System Security Screen Options

Option	Description
System Password	Displays the current status of your system's password security feature and allows you to assign and verify a new password. **NOTE:** See "Using the System Password" on page 51 for instructions on assigning a password and using or changing an existing server module password.

Table 2-7. System Security Screen Options *(continued)*

Option	Description
Setup Password	Restricts access to the System Setup program in the same way that you restrict access to your system using the **System Password** feature. **NOTE:** See "Using the System Password" on page 51 for instructions on assigning a setup password and using or changing an existing setup password.
Password Status	Setting the **Setup Password** option to **Enabled** prevents the system password from being changed or disabled at start-up. To *lock* the system password, assign a setup password in the **Setup Password** option and then change the **Password Status** option to **Locked**. In this state, you cannot change the system password using the **System Password** option and the system password cannot be disabled at start-up by pressing <Ctrl><Enter>. To *unlock* the system password, enter the setup password in the **Setup Password** field and then change the **Password Status** option to **Unlocked**. In this state, you can disable the system password at start-up by pressing <Ctrl><Enter> and then change the password using the **System Password** option.
Power Button	Enables or disables the server module's power button. • If you turn off the server module using the power button and you are using an ACPI-compliant operating system, the server module can perform an orderly shutdown before power is turned off. • If the server module is not running an ACPI-compliant operating system, power is turned off immediately after the power button is pressed. The button is enabled in the System Setup program. When disabled, the button can only turn on server module power.
AC Power Recovery (**Last** default)	Determines how the server module reacts when power is restored. If the option is set to **Last**, the server module returns to the last power state. **On** turns on the server module after power is restored. When set to **Off**, the server module remains off after power is restored.

Exit Screen

After you press <Esc> to exit the System Setup program, the **Exit** screen displays the following options:

- `Save Changes and Exit`
- `Discard Changes and Exit`
- `Return to Setup`

System and Setup Password Features

NOTICE: The password features provide a basic level of security for the data on your system. If your data requires more security, use additional forms of protection, such as data encryption programs.

NOTICE: Anyone can access the data stored on your system if you leave the system running and unattended without having a system password assigned or if you leave your system unlocked so that someone can disable the password by changing a jumper setting.

Your system is shipped to you without the system password feature enabled. If system security is a concern, operate your system only with system password protection.

To change or delete an existing password, you must know the password (see "Deleting or Changing an Existing System Password" on page 53). If you forget your password, you cannot operate your system or change settings in the System Setup program until a trained service technician changes the password jumper setting to disable the passwords, and erases the existing passwords. See "Disabling a Forgotten Password" on page 126.

Using the System Password

After a system password is assigned, only those who know the password have full use of the system. When the **System Password** option is set to **Enabled**, the system prompts you for the system password after the system starts.

Assigning a System Password

Before you assign a system password, enter the System Setup program and check the **System Password** option.

When a system password is assigned, the setting shown for the **System Password** option is **Enabled**. If the setting shown for the **Password Status** is **Unlocked**, you can change the system password. If the **Password Status** option is **Locked**, you cannot change the system password. When the system password feature is disabled by a jumper setting, the system password is **Disabled**, and you cannot change or enter a new system password.

When a system password is not assigned and the password jumper on the system board is in the enabled (default) position, the setting shown for the **System Password** option is **Not Enabled** and the **Password Status** field is **Unlocked**. To assign a system password:

1. Verify that the **Password Status** option is set to **Unlocked**.
2. Highlight the **System Password** option and press <Enter>.
3. Type your new system password.

   You can use up to 32 characters in your password.

   As you press each character key (or the spacebar for a blank space), a placeholder appears in the field.

The password assignment is not case-sensitive. However, certain key combinations are not valid. To erase a character when entering your password, press <Backspace> or the left-arrow key.

NOTE: To escape from the field without assigning a system password, press <Enter> to move to another field, or press <Esc> at any time prior to completing step 5.

4 Press <Enter>.

5 To confirm your password, type it a second time and press <Enter>.

The setting shown for the **System Password** changes to **Enabled**. Exit the System Setup program and begin using your system.

6 Either reboot your system now for your password protection to take effect or continue working.

NOTE: Password protection does not take effect until you reboot the system.

Using Your System Password to Secure Your System

NOTE: If you have assigned a setup password (see "Using the Setup Password" on page 53), the system accepts your setup password as an alternate system password.

When the **Password Status** option is set to **Unlocked**, you have the option to leave the password security enabled or to disable the password security.

To leave the password security enabled:

1 Turn on or reboot your system by pressing <Ctrl><Alt><Del>.

2 Press <Enter>.

3 Type your password and press <Enter>.

To disable the password security:

1 Turn on or reboot your system by pressing <Ctrl><Alt><Del>.

2 Press <Ctrl><Enter>.

When the **Password Status** option is set to **Locked** whenever you turn on your system or reboot your system by pressing <Ctrl><Alt><Del>, type your password and press <Enter> at the prompt.

After you type the correct system password and press <Enter>, your system operates as usual.

If an incorrect system password is entered, the system displays a message and prompts you to re-enter your password. You have three attempts to enter the correct password. After the third unsuccessful attempt, the system displays an error message showing the number of unsuccessful attempts and that the system has halted and will shut down. This message can alert you to an unauthorized person attempting to use your system.

Even after you shut down and restart the system, the error message continues to be displayed until the correct password is entered.

NOTE: You can use the **Password Status** option in conjunction with the **System Password** and **Setup Password** options to further protect your system from unauthorized changes.

Deleting or Changing an Existing System Password

1. When prompted, press <Ctrl><Enter> to disable the existing system password.

   If you are asked to enter your setup password, contact your network administrator.
2. Enter the System Setup program by pressing <F2> during POST.
3. Select the **System Security** screen field to verify that the **Password Status** option is set to **Unlocked**.
4. When prompted, type the system password.
5. Confirm that **Not Enabled** is displayed for the **System Password** option.

   If **Not Enabled** is displayed for the **System Password** option, the system password has been deleted. If **Enabled** is displayed for the **System Password** option, press the <Alt><b> key combination to restart the system, and then repeat steps 2 through 5.

Using the Setup Password

Assigning a Setup Password

You can assign (or change) a setup password only when the **Setup Password** option is set to **Not Enabled**. To assign a setup password, highlight the **Setup Password** option and press the <+> or <–> key. The system prompts you to enter and verify the password.

NOTE: The setup password can be the same as the system password. If the two passwords are different, the setup password can be used as an alternate system password. However, the system password cannot be used in place of the setup password.

You can use up to 32 characters in your password.

As you press each character key (or the spacebar for a blank space), a placeholder appears in the field.

The password assignment is not case-sensitive. However, certain key combinations are not valid. To erase a character when entering your password, press <Backspace> or the left-arrow key.

After you verify the password, the **Setup Password** setting changes to **Enabled**. The next time you enter the System Setup program, the system prompts you for the setup password.

A change to the **Setup Password** option becomes effective immediately (restarting the system is not required).

Operating With a Setup Password Enabled

If **Setup Password** is set to **Enabled**, you must enter the correct setup password before you can modify most of the System Setup options. When you start the System Setup program, the program prompts you to enter a password.

If you do not enter the correct password in three attempts, the system lets you view, but not modify, the System Setup screens—with the following exception: If **System Password** is not set to **Enabled** and is not locked through the **Password Status** option, you can assign a system password (however, you cannot disable or change an existing system password).

NOTE: You can use the **Password Status** option in conjunction with the **Setup Password** option to protect the system password from unauthorized changes.

Deleting or Changing an Existing Setup Password

1. Enter the System Setup program and select the **System Security** option.
2. Highlight the **Setup Password** option, press <Enter> to access the setup password window, and press <Enter> twice to clear the existing setup password.

   The setting changes to **Not Enabled**.
3. If you want to assign a new setup password, perform the steps in "Assigning a Setup Password" on page 53.

Disabling a Forgotten Password

See "Disabling a Forgotten Password" on page 126.

Acquiring the asset.com Utility

The **asset.com** utility is not located in the Service Mode section of the *Dell OpenManage Server Assistant* CD. To acquire this utility, use the *Server Assistant* CD to create a bootable diskette; the utility is then automatically created on that diskette. The **asset.com** utility will be available in the Service Mode section in future releases of the *Server Assistant* CD.

Baseboard Management Controller Configuration

The Baseboard Management Controller (BMC) enables configuring, monitoring, and recovery of systems remotely. BMC provides the following features:

- Uses the system's integrated NIC
- Fault logging and SNMP alerting
- Access to system event log and sensor status
- Control of system functions including power on and off
- Support is independent of the system's power or operating state
- Provides text console redirection for system setup, text-based utilities, and operating system consoles

NOTE: To remotely access the BMC through the integrated NIC, you must connect the network connection to integrated NIC1.

For additional information on using BMC, see the documentation for the BMC and systems management applications.

Entering the BMC Setup Module

1. Turn on or restart your system.
2. Press <Ctrl-E> when prompted after POST.

   If your operating system begins to load before you press <Crtl-E>, allow the system to finish booting, and then restart your system and try again.

BMC Setup Module Options

For information about the BMC Setup Module options and how to configure the emergency management port (EMP), see the *BMC User's Guide*.

3

Installing System Options

The procedures in this section describe how to remove and install system components and server module components, including:

- Power supply modules
- Fan Modules
- Dell Remote Access Controller/Modular Chassis (DRAC/MC) module
- KVM modules
- Network switch modules
- Server modules
- Server module components
  - Memory modules
  - Daughter cards
  - TOE NIC
  - Processors
  - Server module battery
  - Hard drives
- Back-panel module cage assembly (service-only procedure)
- Chassis control panel assembly (service-only procedure)
- Server module control panel assembly (service-only procedure)
- System board (service-only procedure)

Power Supply Modules

Your system contains up to four hot-pluggable power supply modules that are accessible from the system chassis back panel.

NOTE: Only 2100-W power supply modules are supported on your system. The 2100-W power supply modules require 180–240 V input from a PDU capable of providing AC current up to 29.2 A at 180 V input. If the power supply modules are plugged into 110-V electrical outlets, the system will not power up.

NOTE: In addition to supplying power to the system, the power supply modules also have internal fans that provide thermal cooling for the server modules. A power supply module must be replaced if an internal fan failure occurs.

System Power Guidelines

The Dell Remote Access Controller/Modular Chassis (DRAC/MC) module controls the power distribution to the chassis and the server modules. The DRAC/MC is programmed to allocate the theoretical maximum power of a chassis with all back-panel modules installed and the theoretical maximum power of a fully-loaded server module for power management and protection purposes. Actual power usage depends on a system's particular configuration; for example, the number of modules installed in the chassis back panel; the number of processors, memory modules, and hard drives installed in a server module; and the number of server modules installed in the chassis.

The number of installed power supply modules determine if your system is redundant. Your system has one of the following configurations:

- Two 2100-W power supply modules, which do not provide redundancy if one power supply module fails
- Four 2100-W power supply modules, which provide redundancy if one power supply module fails

NOTE: Depending on a non-redundant system's particular configuration, it is possible for some of the server modules to continue to operate even though a power supply module fails. If this occurs, and the server module that you want to operate is off, then power down the operating server modules until the desired server module powers up.

In addition, if you install a new server module and it does not power up, ensure that your system meets the normal operating-power configurations listed above. Only those configurations support a fully-loaded system.

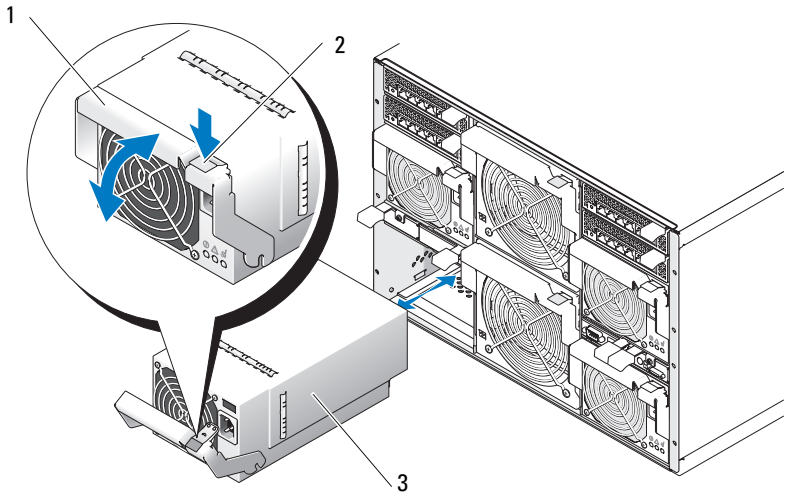
NOTE: The wattage of a power supply module is listed on its regulatory label.

Removing a Power Supply Module

NOTICE: The power supply modules are hot-pluggable. Remove and replace only one power supply module at a time in a system that is turned on.

1. Disconnect the power cord from the power supply module.
2. Press down on the power supply module release tab. See Figure 3-1.
3. Rotate the power supply module handle down to eject the power supply module.
4. Slide the power supply module out of the chassis.

Figure 3-1. Removing and Installing a Power Supply Module



1 handle 2 release tab 3 power supply module

Installing a Power Supply Module

1. Ensure that the power-supply module handle is fully down and then slide the power supply module into the chassis until it is fully seated. See Figure 3-1.
2. Rotate the power-supply module handle upward until its release tab snaps securely into place.
3. Plug a power cable into the power supply module.

Fan Modules

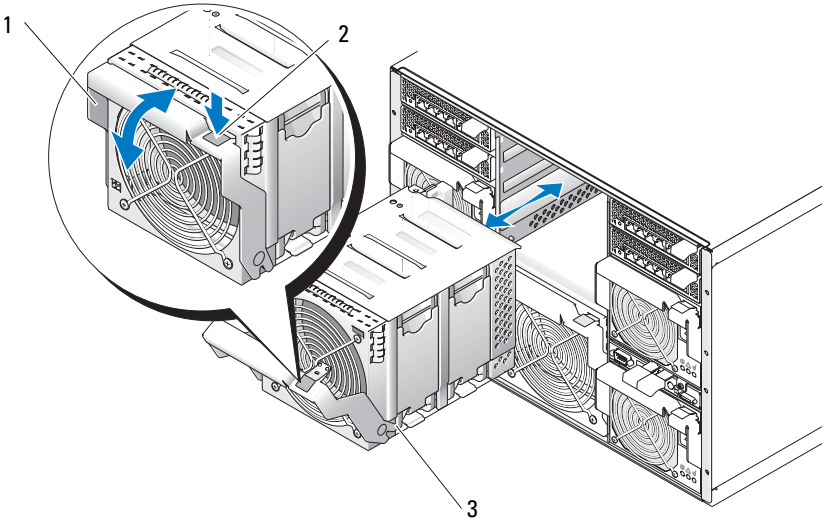
Your system contains up to four system fans (two sets of redundant fans) contained in two hot-pluggable fan modules. Each fan module has system fan indicators on its back panel that identify the status of each of its system fans. See Figure 1-7.

Removing a Fan

NOTICE: After a fan module is removed from the system, replace it immediately to ensure proper cooling.

1. Identify the failed system fan using the back-panel fan module indicators. See Figure 1-7.
   Fan 1 is the fan closest to the chassis midplane; Fan 2 is the fan closest to the fan-module handle.
2. Remove the fan module:
   a. Press down on the fan-module release tab. See Figure 3-2.
   b. Rotate the fan-module handle down to eject the fan module.
   c. Slide the fan module out of the chassis.

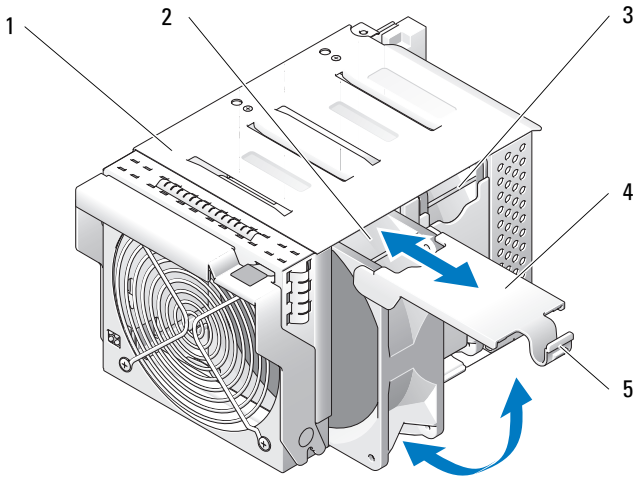
Figure 3-2. Removing and Installing a Fan Module



1 handle 2 release tab 3 fan module

3. Remove the failed fan:
   a. Pull up the fan-release tab. See Figure 3-3.
   b. Lift up the fan lever.
   c. Pull out the fan from the fan module.

Figure 3-3. Removing and Installing a System Fan



1	fan module	2	fan 2	3	fan 1
4	fan lever	5	fan-release tab		

Installing a Fan

1. Orient the replacement fan as shown in Figure 3-3.
2. Install the fan:
   a. Slide the fan into the fan module.
   b. Lower its fan lever.
   c. Press the bottom of the lever until it snaps securely into place.
3. Slide the fan module into the chassis until it is fully seated. See Figure 3-2.
4. Rotate the fan-module handle upward until its release tab snaps securely into place.

DRAC/MC Module

Among other controlling features, the DRAC/MC controls power to the system. When a functional DRAC/MC module is not installed, newly-installed server modules cannot be powered on and presently installed servers modules cannot have their power cycled.

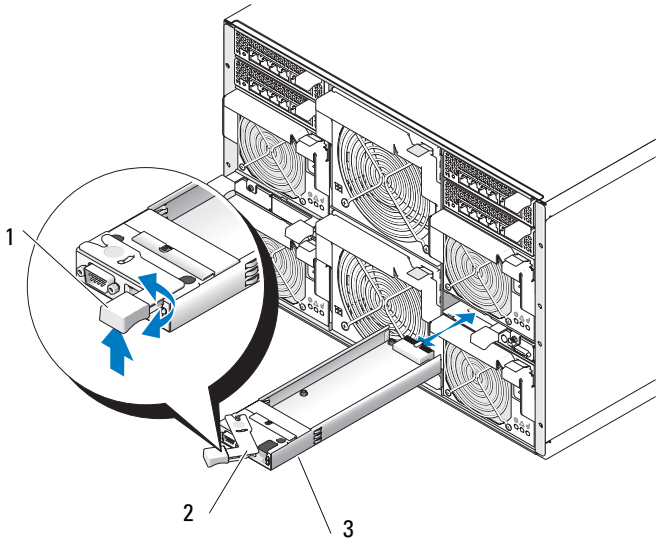
Removing a DRAC/MC Module

1. Disconnect any cables attached to the DRAC/MC module.
2. Press in the bottom of the release tab and pull out the release lever. See Figure 3-4.
3. Slide the DRAC/MC module out of the chassis.

Installing a DRAC/MC Module

1. Ensure that the DRAC/MC module release lever is fully extended. See Figure 3-4.
2. Slide the module into the chassis until it is fully seated.
3. Close the release lever until it snaps securely into place.
4. Reconnect the cables that were attached to the module.

Figure 3-4. Removing and Installing a DRAC/MC Module



1 release tab 2 release lever 3 DRAC/MC module

Important I/O Configuration Considerations

Ensure that you read the DRAC/MC's **readme.txt** file. It contains updated information, including system indicator behavior in certain conditions.

CAUTION: Data loss can result if you perform certain actions on a system in which the I/O bays have not been configured correctly. Specifically, bay 2 should have an I/O module installed only if a module of the same fabric type is present in bay 1, and bay 4 should have an I/O module installed only if a module of the same fabric type is present in bay 3. Except in these cases (or in a case where you temporarily need to swap a failed I/O module in bay 1 or 3), bays 2 and 4 should be unoccupied.

Unless your system is configured according to these guidelines, do not perform any of the following actions:

- **Upgrade DRAC/MC firmware**
- **Issue a software reset command for a DRAC/MC, such as racadm racreset**

- **Reseat a DRAC/MC module**
- **Cause a DRAC/MC failover event, such as removing the network cable from the primary DRAC/MC**

Performing any of these actions will power off and stop traffic on the bay 2 or bay 4 I/O module, resulting in data loss.

When initiated, the DRAC/MC firmware algorithm must find a module in bay 1 before bay 2 and a module in bay 3 before bay 4. Otherwise, the module in bay 2 or bay 4 will be powered off if you perform a firmware upgrade procedure on the DRAC/MC, cause a DRAC/MC failover, or reset the DRAC/MC.

See the current *Dell Remote Access Controller/Modular Chassis User's Guide* at **support.dell.com** for more information about configuring your DRAC/MC system.

DRAC/MC Firmware Requirements

The minimum DRAC/MC firmware requirement for your system is version 1.3 or later. If you are adding a second DRAC/MC module with version 1.0 to support redundancy, you must upgrade the module's firmware to version 1.1, then upgrade the firmware to version 1.3 (or later).

NOTE: A DRAC/MC module's firmware version is displayed on its web-based GUI or by typing the command `getsysinfo` or `racadm getsysinfo`.

See the latest *Dell Remote Access Controller/Modular Chassis User's Guide* at **support.dell.com** for more information about firmware updates and installing redundant DRAC/MC modules. This guide also provides complete instructions on how to set up and operate that version of the module.

KVM Module

Your system includes one hot-pluggable KVM module. One of two types of KVM modules may be installed: an Avocent Analog KVM switch module, or an Avocent Digital Access KVM switch module. Both modules enable you to connect a PS/2-compatible keyboard and mouse and a video monitor to the system, using a custom cable provided with the system. See "KVM Modules" in "Indicators, Codes, and Messages" for more information about the features of these modules. See your system *Configuration Guide* for instructions on how to select a server module from the keyboard connected to the KVM module.

Removing a KVM Module

1. Disconnect any cables attached to the KVM module.
2. Loosen the Phillips screw that secures the release lever to the module. See Figure 3-5.
3. Pull out the release lever and slide the KVM module out of the chassis.

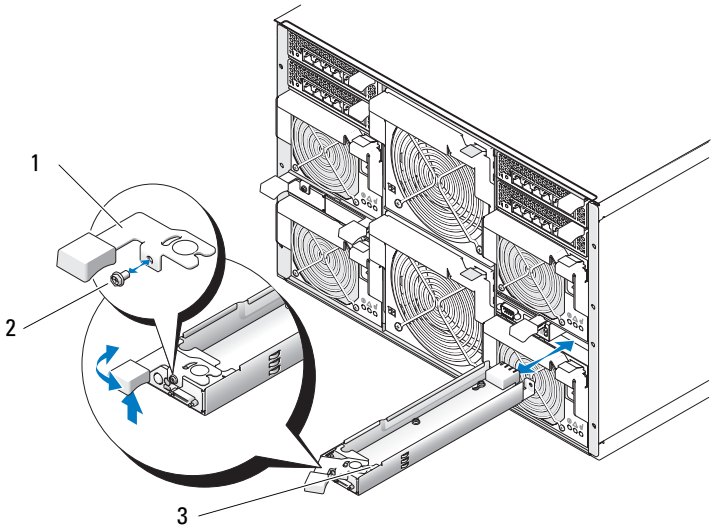
Installing a KVM Module

1. Ensure that the KVM module release lever is fully extended. See Figure 3-5.
2. Slide the module into the chassis until it is fully seated.
3. Close the release lever until it snaps securely into place.

4 Secure the release lever to the module with the Phillips screw.

5 Reconnect the custom cable to the KVM module and connect the keyboard, monitor, and mouse to the custom cable.

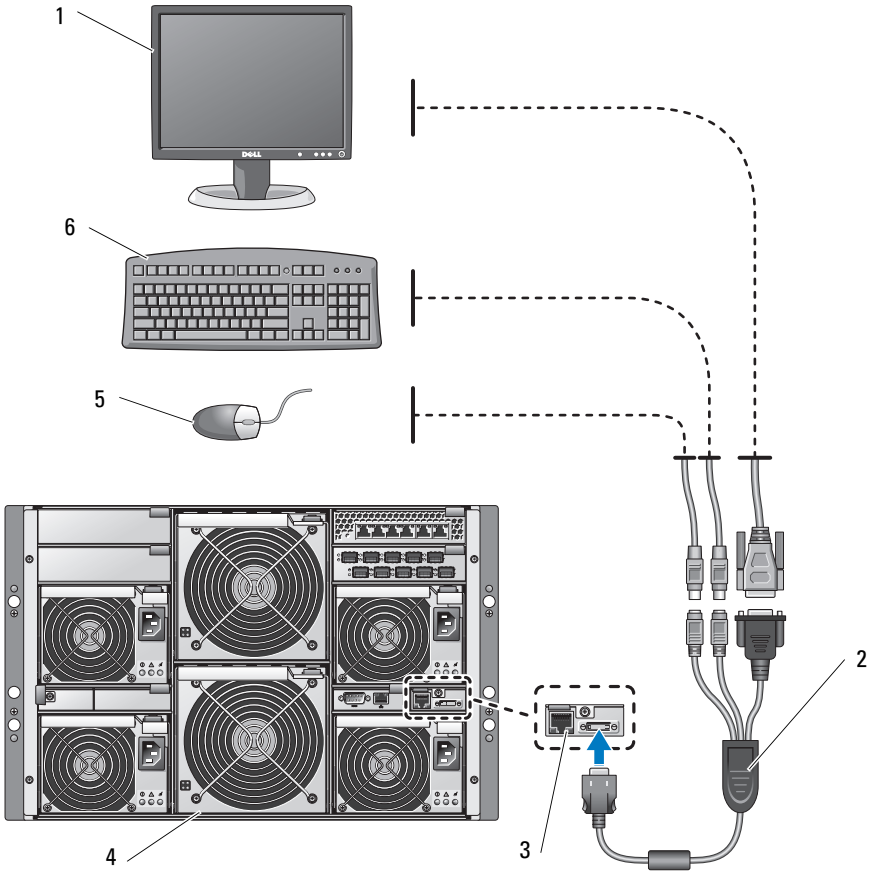
Figure 3-5. Removing and Installing a KVM Module



1 release lever 2 securing screw 3 KVM module

Figure 3-6 shows the basic cabling configuration for a KVM module. For information on configuring the KVM module, see the *Configuration Guide* provided with your system.

Figure 3-6. KVM Module Basic Configuration



1	monitor	2	custom KVM cable	3	KVM module
4	system	5	mouse	6	keyboard

Tiering an Avocent Analog KVM Switch or Avocent Digital Access KVM Switch From a Analog KVM Switch

Both Avocent KVM switches can be tiered from analog KVM switches such as the Dell180ES and 2160ES, as well as other products that support the On-Screen Configuration and Activity Reporting (OSCAR) interface.

Before connecting the KVM switch to a supported analog switch, you must set the KVM switch to display in slot order, and set the **Screen Delay Time** to 1 or more seconds:

1. Press <Print Screen> to launch the KVM Switch OSCAR.
2. Click **Setup** > **Menu**. The **Menu** dialog box appears.
3. Select **Slot** to display servers numerically by slot number.
4. Enter a screen delay time of at least 1 second.
5. Click **OK**.

Setting the Screen Delay time to 1 second allows you to soft switch to a server without launching OSCAR.

NOTE: Soft switching allows you to switch servers using a hot key sequence. You can soft switch to a server by pressing <Print Screen> and then typing the first few characters of its name or number. If you have a Delay Time set and you press the key sequences before that time has elapsed, OSCAR will not display.

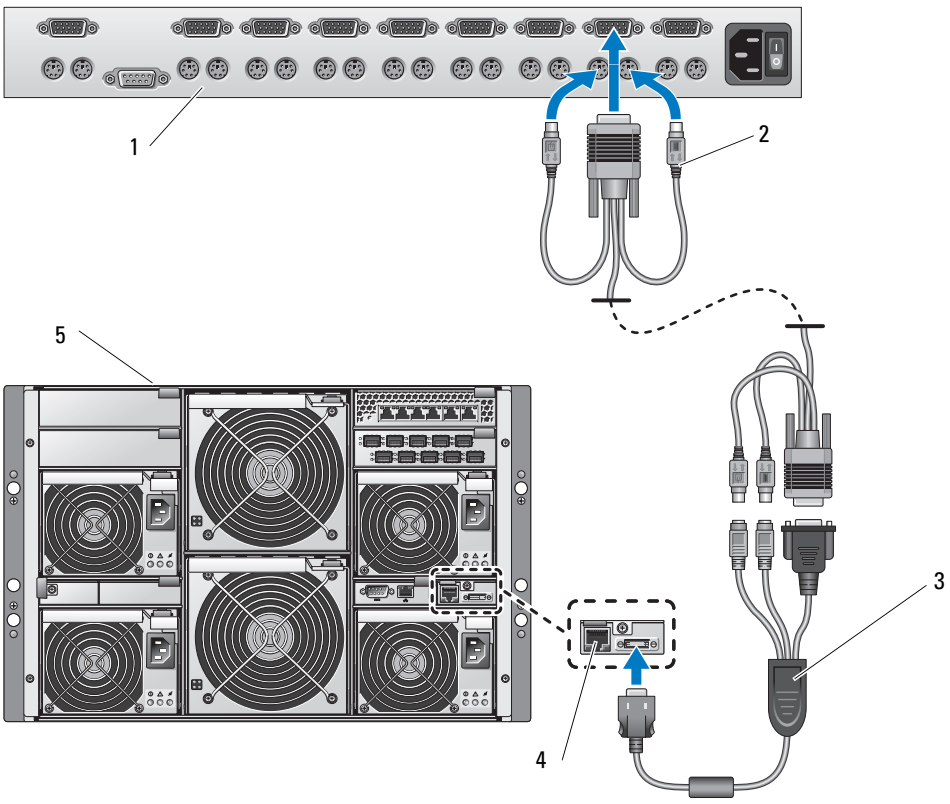
To configure the analog switch:

1. Press <Print Screen> to open the OSCAR **Main** dialog box.
2. Click **Setup** > **Devices** > **Device Modify**.
3. Select the 10-port option to match the number of slots in your system. If the 10-port option is not available, select the 16-port option.
4. Click **OK** to exit OSCAR.
5. Press <Print Screen> to verify that the settings have taken effect. The slot number of the server module to which the KVM switch is now attached should be expanded to display each of the slot locations of the server modules in the system. For instance, if the KVM switch is attached to slot 1, it would now be displayed as 01-01 to 01-10.

To connect the Avocent KVM switch to a supported analog switch:

1. Connect the keyboard, video, and mouse cable to the analog switch.
2. Connect the other end of this cable to the custom cable.
3. Connect the custom KVM cable to the KVM port of the KVM switch (see Figure 3-7.)

Figure 3-7. Avocent Analog or Digital KVM Switch Tiered from an Analog KVM Switch



1	analog switch	2	keyboard, video, and mouse interconnecting cable	3	custom KVM cable
4	KVM switch	5	system		

4 Connect both the analog switch and the system to an appropriate power source.

5 Power up the system.

6 Power up the analog switch.

NOTE: If the analog switch is powered up before the system, it may result in only one server module displaying in the analog switch OSCAR, instead of 10.

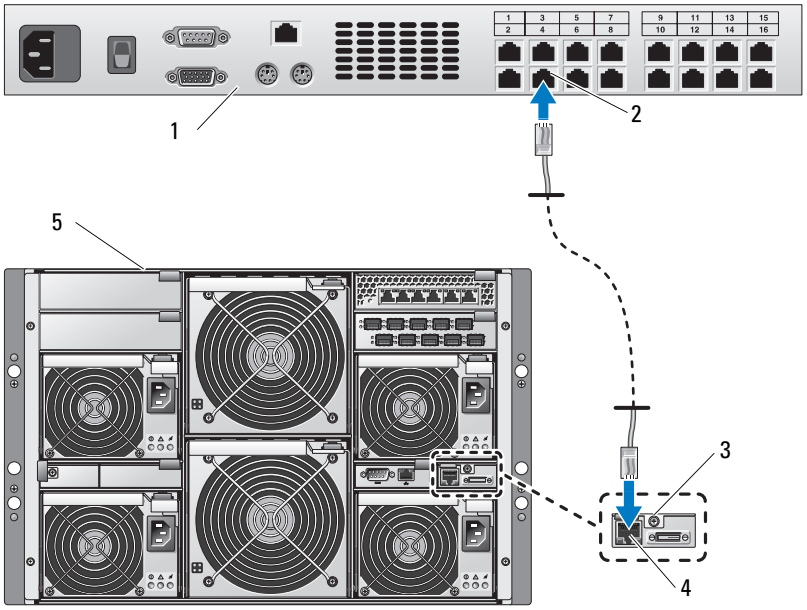
NOTE: In addition, to the steps outlined above, some analog switches may require you to perform additional steps to ensure that the KVM switch server modules appear in the analog switch OSCAR. See the analog switch documentation for additional information.

Tiering an Avocent Analog KVM Switch From a Dell Console Switch

To tier an Avocent Analog KVM switch from a Dell 2161DS, 180AS, or 2160AS console switch, connect the ACI port on the rear of the Avocent Analog KVM switch to one of the 16 ARI ports on the back of the Dell console switch (see Figure 3-8).

NOTE: Do not connect the KVM switch ACI port to a LAN device such as a network hub. Doing so may result in equipment damage.

Figure 3-8. Tiering an Avocent Analog KVM Switch from a Dell Console Switch



1	Dell console switch	2	ARI port	3	analog KVM switch
4	ACI port	5	system		

Once the KVM switch is connected, the server modules appear in OSCAR. The Dell console switch will automatically configure the slots in the KVM menu.

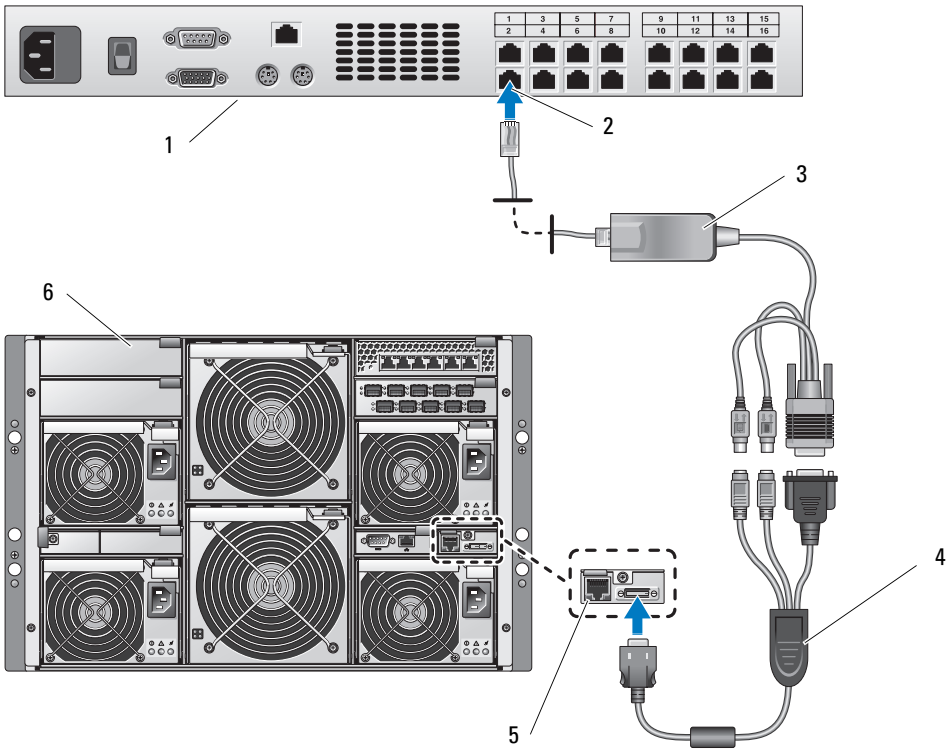
NOTE: Once the local system is set up, you must also resynchronize the server list from the Remote Console Switch software in order to see the list of server modules. See "Resynchronizing the Server List at the Remote Client Workstation."

Tiering an Avocent Digital Access KVM Switch From a Dell Console Switch

To tier a Avocent Digital Access KVM switch module from a Dell 2161DS, 180AS, or 2160AS console switch:

1. Connect one end of a CAT5 cable to an ARI port on the console switch (see Figure 3-9).
2. Connect the other end of the CAT5 cable to a Server Interface Pod (SIP).
3. Connect the local KVM cable to the local KVM port of the KVM switch and then to the SIP.
4. Once the KVM switch is connected, the server modules appear in OSCAR.

Figure 3-9. Tiering a Avocent Digital Access KVM Switch from a Dell Console Switch



1	Dell console switch	2	ARI port	3	server interface pod (SIP)
4	custom KVM cable	5	digital KVM switch	6	system

Once connected, the Dell console switch will automatically configure the slots in the KVM menu.

NOTE: Once the local system is set up, you must also resynchronize the server list from the Remote Console Switch software in order to see the list of server modules. See "Resynchronizing the Server List at the Remote Client Workstation."

Resynchronizing the Server List at the Remote Client Workstation

Once the KVM switch is connected, the server modules appear in OSCAR. You now need to resynchronize the servers on any remote workstation to ensure that the server modules are now available to any remote users that are connected to the console switch through the Remote Console Switch software.

NOTE: This procedure only resynchronizes one remote client workstation. With multiple client workstations, save the resynchronized local database and load it into the other client workstations to ensure consistency.

To resynchronize the server listing:

1. Click **Resync** in the **Server** category of the Management Panel (MP).

   The Resync Wizard launches.

2. Click **Next**.

   A warning message displays indicating that the database will be updated to match the current configuration of the console switch. Your current local database names will be overridden with the switch names. To include unpowered SIPs in the resynchronization, click to enable the **Include Offline SIPs** check box.

3. Click **Next**.

   A **Polling Remote Console Switch** message box appears with a progress bar indicating that the switch information is being retrieved.

4. If no changes were detected in the appliance, a completion dialog box appears with this information.

   If server changes were detected, then the **Detected Changes** dialog box will be displayed. Click **Next** to update the database.

5. If a cascade switch was detected, the **Enter Cascade Switch Information** dialog box appears. Select the type of switch connected to the appliance from the drop-down list. If the type you are looking for is not available, you can add it by clicking **Add**.

6. Click **Next**. The completion dialog box appears.

7. Click **Finish** to exit.

8. Start up the analog switch and the system.

Chassis I/O Module

A variety of I/O modules, such as Fibre Channel pass-through, Fiber Channel switch, Ethernet pass-through, Infiniband pass-through, and PowerConnect 5316M Ethernet switch modules are available for your system. Some I/O modules also require a supporting daughter card that must be installed inside each server module that communicates with that particular I/O module. The system can accommodate up to four hot-pluggable I/O modules.

You do not have to turn off the system to replace an I/O module of the same type; however, your network connectivity does not return until the replacement module is installed and initialized.

I/O Module Placements

The back panel has four bays for I/O modules and are labeled IO/1, IO/2, IO/3, and IO/4 (see Figure 1-5). PowerConnect 5316M Ethernet switch modules or Ethernet pass-through modules must be installed in either bay IO/1 or IO/2. All other types of matching I/O modules can be installed in IO/3 and IO/4. See " Guidelines for Installing Connectivity Modules" in "Indicators, Messages, and Codes" for guidelines on installing I/O modules.

Bays IO/1 and IO/3 are primary bays and bays IO/2 and IO/4 are secondary bays. The secondary bays provide redundancy or additional connectivity, if desired. If only one type of I/O module is installed, it must be installed in the primary bay.

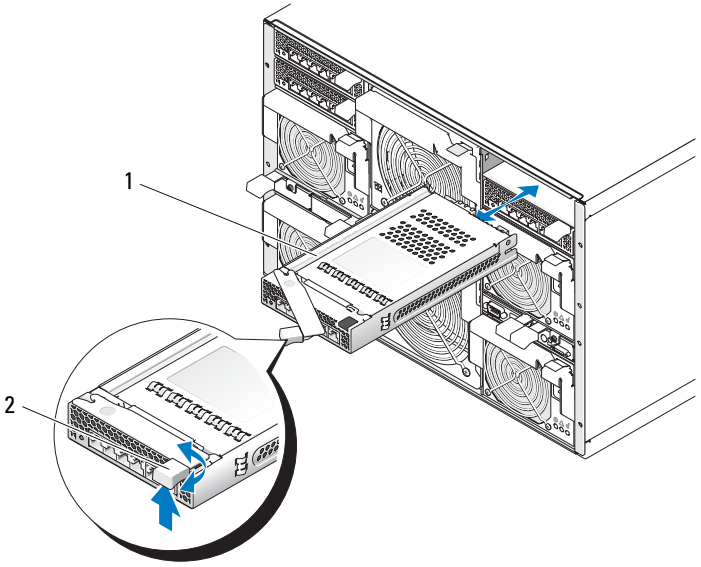
Removing an I/O Module

1. Disconnect any cables attached to the I/O module.
2. Press in the bottom of the release tab and pull out the release lever. See Figure 3-10.
3. Pull out the release lever and slide the I/O module out of the chassis.
4. If you are removing the I/O module permanently:
   a. If the I/O module uses a supporting daughter card, uninstall the card from inside the server module(s). See "Removing a Daughter Card" on page 83.

NOTICE: You must install a filler bracket over an empty I/O module slot to maintain Federal Communications Commission (FCC) certification of the system. The brackets also help keep dust and dirt out of the system and aid in proper cooling and airflow inside the system.

   b. Install a metal filler bracket over the empty slot opening.

Figure 3-10. Removing and Installing an I/O Module



1 I/O module 2 release lever

Installing an I/O Module

1. Unpack the I/O module and prepare it for installation.

   For instructions, see the documentation that accompanied the module.

2. Install the I/O module.

   NOTE: Bays IO/1 and IO/2 accept only PowerConnect 5316M Ethernet switch modules or Gb Ethernet pass-through modules. If only one module is used, it must be installed in bay IO/1. Bay IO/2 is for a second PowerConnect 5316M Ethernet switch module or Gb Ethernet pass-through module for redundancy.

   a. Ensure that the I/O module release lever is fully extended. See Figure 3-10.

   b. Slide the module into the chassis until it is fully seated.

   c. Close the release lever until it snaps securely into place.

3. If a daughter card(s) was included with the new I/O module, install the daughter card(s). See "I/O Module Daughter Card" on page 82.

   NOTE: The daughter card enables a server module to communicate with the corresponding connector number on its appropriate I/O module. For example, server module number 5 must have a Fibre-Channel daughter card installed to communicate with the Fibre Channel pass-through module connector number 5 (primary and secondary bays).

4 Reconnect any cables that must be attached to the module.

See the documentation that accompanied the I/O module for information about its cable connections.

Server Modules

Your system can include up to 10 hot-pluggable server modules. Each server module can contain up to two processors, two hard drives, six memory modules, and one daughter card.

Removing a Server Module

1 Ensure that the server module's power is off.

When a server module is powered off, its front-panel power indicator is amber. See Figure 1-3.

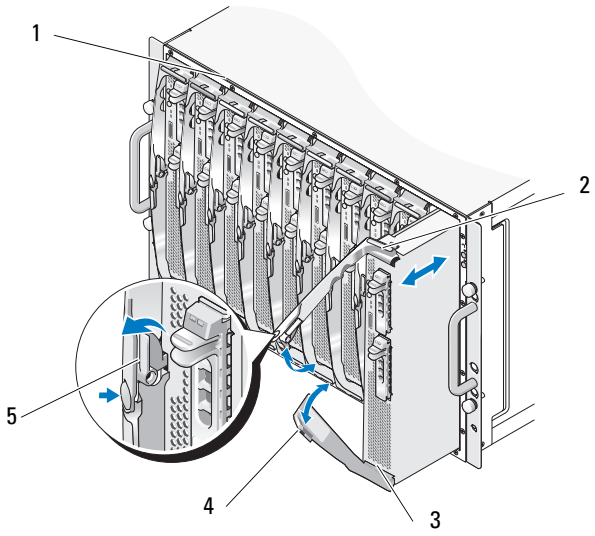
2 Press in the release latch on the inside of the upper handle. See Figure 3-11.

3 Pull out both the upper and the lower handles to eject the server module from the chassis.

4 Slide the server module out of the chassis.

NOTICE: If you are permanently removing the server module, install a server module blank. Operating the system for extended periods of time without a server module blank installed can cause the system to overheat.

Figure 3-11. Removing and Installing a Server Module



1	chassis	2	upper handle	3	server module
4	lower handle	5	release latch inside of upper handle		

Installing a Server Module

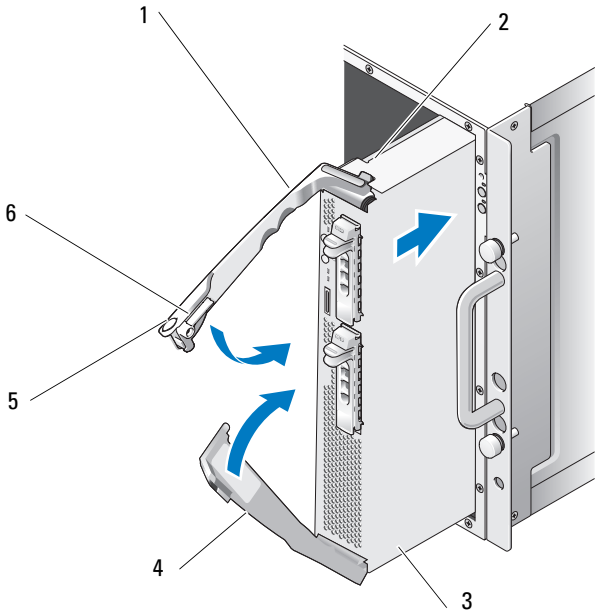
NOTICE: Follow this procedure carefully—it is possible to insert the server module upside-down, which may damage the chassis midplane and the server module.

1. Orient the server module so that its top side is up. The server module is correctly oriented for installation when its components have the characteristics described below:
   a. The server module's upper handle is above (outside) the lower handle.

      The upper handle has the DELL logo™ on it, extends farther out than the lower handle, and has a release latch on its inside. See Figure 3-12.

   b. The upper edge of the server module has "TOP-SIDE" engraved in it. See Figure 3-12.

Figure 3-12. Proper Server Module Installation Orientation



1	upper handle	2	"TOP-SIDE" engraved in server module	3	server module
4	lower handle	5	logo	6	release latch inside of upper handle

2. Slide the server module into the chassis until the open handles touch the front panel of the chassis.
3. Rotate both handles inward until the lower handle is flush against the server module's front panel.

   The lower handle automatically closes before the upper handle.

4 Continue to rotate the upper handle inward until it is flush against the lower handle.

The upper-handle release latch locks both handles to the front panel of the server module when the handles are properly closed.

5 Turn on the server module by pressing the module's power button.

Opening the Server Module

CAUTION: Only trained service technicians are authorized to remove the system cover and access any of the components inside the system. See your *Product Information Guide* for complete information about safety precautions, working inside the computer, and protecting against electrostatic discharge.

1 Remove the server module. See "Removing a Server Module."

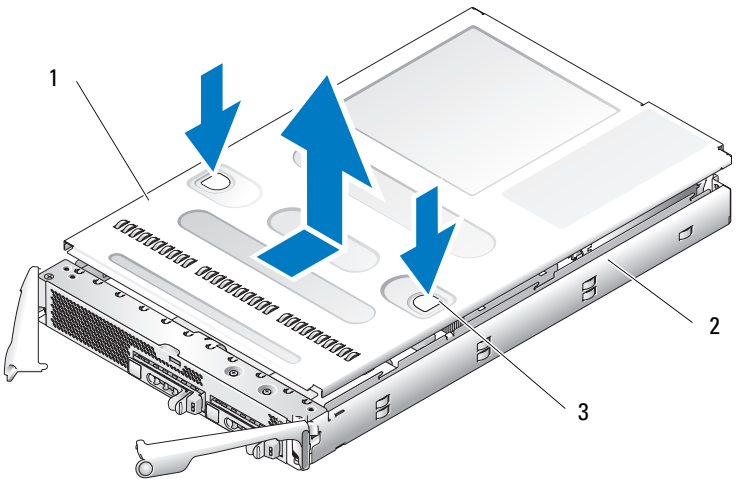
2 Orient the server module as shown in Figure 3-13 so that the two cover-release buttons are facing up.

3 Press down on both cover-release buttons and slide the cover toward the back of the server module until it stops.

4 Carefully lift the cover away from the server module.

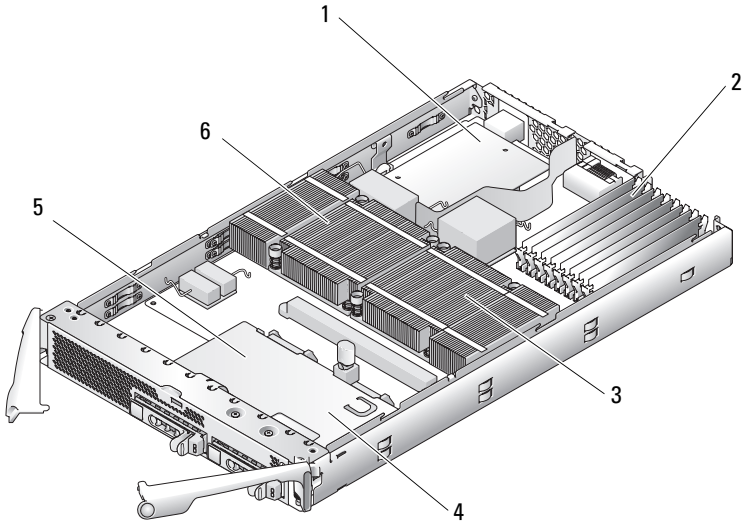
Figure 3-14 illustrates the major components of the inside of the server module.

Figure 3-13. Opening a Server Module



1 cover 2 server module 3 cover-release buttons (2)

Figure 3-14. Inside a Server Module



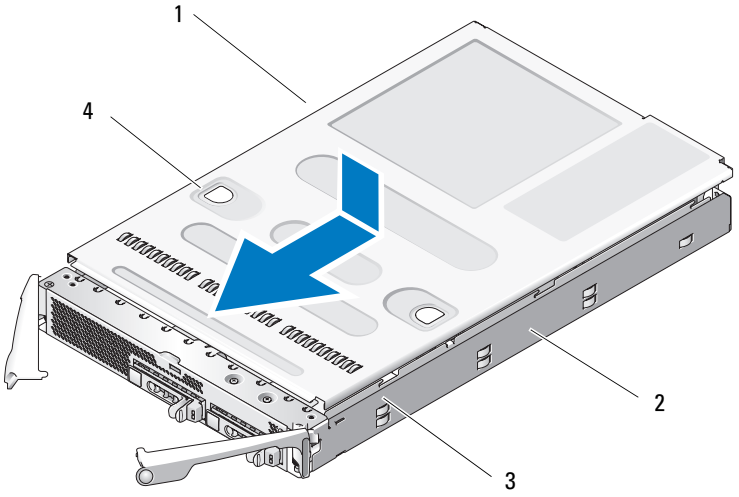
1	optional daughter card	2	memory modules	3	heat sink and processor 2
4	hard drive 0	5	hard drive 1	6	heat sink and processor 1

Closing the Server Module

CAUTION: Only trained service technicians are authorized to remove the system cover and access any of the components inside the system. See your *Product Information Guide* for complete information about safety precautions, working inside the computer, and protecting against electrostatic discharge.

1. Ensure that no tools or parts are left inside the system.
2. Align the cover with the cover alignment pins on the sides of the chassis, and slide the cover forward. See Figure 3-15.
3. Install the server module. See "Installing a Server Module."

Figure 3-15. Closing a Server Module



1	cover	2	server module	3	alignment pins (6)
4	cover-release buttons (2)				

Removing and Installing Server Module Components

The following procedures describe how to remove and install the following components:

- Memory modules
- Daughter cards
- Integrated NIC TOE feature
- Processors
- Server module battery
- Hard drives

Memory

You can add system memory to a maximum capacity of 32 GB (dual-ranked memory modules) or 16 GB (single-ranked memory modules) by installing 533-MHz or 677-Mhz (when available) fully buffered DIMM(FBD) DDR II memory modules. 256-MB, 512-MB, 1-GB, 2-GB, and 4-GB memory modules are supported. You can purchase memory upgrade kits from Dell.

NOTICE: Use only 533-MHz or 677-MHz (when available) DDR II FB memory modules.

The eight memory module sockets are divided into two equal branches (0 and 1). Each branch consists of two channels:

- Branch 0: Channel 0 (DIMM 1, DIMM 5) and channel 1 (DIMM 2, DIMM 6)
- Branch 1: Channel 2 (DIMM 3, DIMM 7) and channel 3 (DIMM 4, DIMM 8)

The first socket of each channel has white release tabs. The memory sockets are located on the system board at the back of the server module. See Figure 6-3 in "Server Module Board Connectors.

General Memory Module Installation Guidelines

- In memory configurations where sparing and mirroring are not supported, the memory modules must be installed in pairs of matched memory size, speed, technology, and vendor, beginning with Branch 0 (Channel 0 and Channel 1).
- The system supports memory mirroring and memory sparing. (Only one of these features can be implemented at one time.) See"Memory Sparing" on page 78 and "Memory Mirroring" on page 79.
- The system supports both single-ranked and dual-ranked memory modules. (Memory modules marked with a "1R" are single ranked and modules marked with a "2R" are dual ranked.) If you install both single-ranked and dual-ranked memory modules, the dual-ranked memory modules must be installed in Branch 1, regardless of capacity.

  NOTE: Dual-rank memory modules with less capacity take precedence over single-ranked memory modules with greater capacity.

NOTICE: For configurations requiring less than eight memory modules, memory module blanks must be installed in four of the unoccupied memory sockets to maintain proper cooling airflow. See Table 3-2.

Memory Sparing

Memory sparing allocates four ranks of memory to a spare bank. These four ranks consist of the first rank of memory in sockets 1 through 4.

- For single-rank memory modules, the entire capacity of the memory modules is allocated to sparing.
- For dual-rank memory modules, only half of the total capacity is allocated to sparing.

Table 3-1 shows how memory sparing divides the available and spared memory in each of the single- and dual-ranked memory module combinations.

Table 3-1. Memory Sparing Configurations

Memory Module Size/Type	Total Memory	Available Memory	Spare Memory
Eight 256-MB single-rank modules	2 GB	1 GB	1 GB
Eight 512-MB single-rank modules	4 GB	2 GB	2 GB
Eight 1-GB single-rank modules	8 GB	4 GB	4 GB
Eight 2-GB single-rank modules	16 GB	8 GB	8 GB
Eight 2-GB dual-rank modules	16 GB	12 GB	4 GB
Eight 4-GB dual-rank modules	32 GB	24 GB	8 GB

The following guidelines apply to memory sparing:

- The system only supports memory sparing if eight identical memory modules are installed (same size, speed, technology, and vendor).
- Sparing is not supported if mirroring is enabled.

You can enable memory sparing through the System Setup program. See "Using the System Setup Program" on page 43.

Memory Mirroring

Memory mirroring provides additional data redundancy and system availability. The system divides the total memory in half and copies identical sets of data to each half. Consequently, the amount of available memory is half the amount of physical memory. If a memory module fails, the data in the mirrored data set is still available, and the system can operate normally until the memory module is replaced.

The following guidelines apply to memory mirroring:

- The system only supports memory mirroring if eight identical memory modules are installed.
- Mirroring is not supported if sparing is enabled.

You can enable memory mirroring through the System Setup program. See "Using the System Setup Program" on page 43.

Sample Memory Configurations

Table 3-2 shows examples of supported memory configurations.

NOTICE: For configurations requiring less than eight memory modules, memory module blanks must be installed in four of the unoccupied memory sockets to maintain proper cooling airflow. See Table 3-2.

Table 3-2. Sample Memory Configurations

	Channel 0		Channel 1		Channel 2		Channel 3	
Total Memory	**DIMM 1**	**DIMM 5**	**DIMM 2**	**DIMM 6**	**DIMM 3**	**DIMM 7**	**DIMM 4**	**DIMM 8**
512 MB	256 MB	blank	256 MB	blank	none	blank	none	blank
1 GB	256 MB	blank	256 MB	blank	256 MB	blank	256 MB	blank
1 GB	512 MB	blank	512 MB	blank	none	blank	none	blank
2 GB	256 MB	256 MB	256 MB	256 MB	256 MB	256 MB	256 MB	256 MB
2 GB	512 MB	blank	512 MB	blank	512 MB	blank	512 MB	blank
4 GB	1 GB	blank	1 GB	blank	1 GB	blank	1 GB	blank
4 GB	512 MB	512 MB	512 MB	512 MB	512 MB	512 MB	512 MB	512 MB
8 GB	2 GB	blank	2 GB	blank	2 GB	blank	2 GB	blank
8 GB	1 GB	1 GB	1 GB	1 GB	1 GB	1 GB	1 GB	1 GB
16 GB	4 GB	blank	4 GB	blank	4 GB	blank	4 GB	blank
16 GB	2 GB	2 GB	2 GB	2 GB	2 GB	2 GB	2 GB	2 GB
32 GB	4 GB	4 GB	4 GB	4 GB	4 GB	4 GB	4 GB	4 GB

Installing Memory Modules

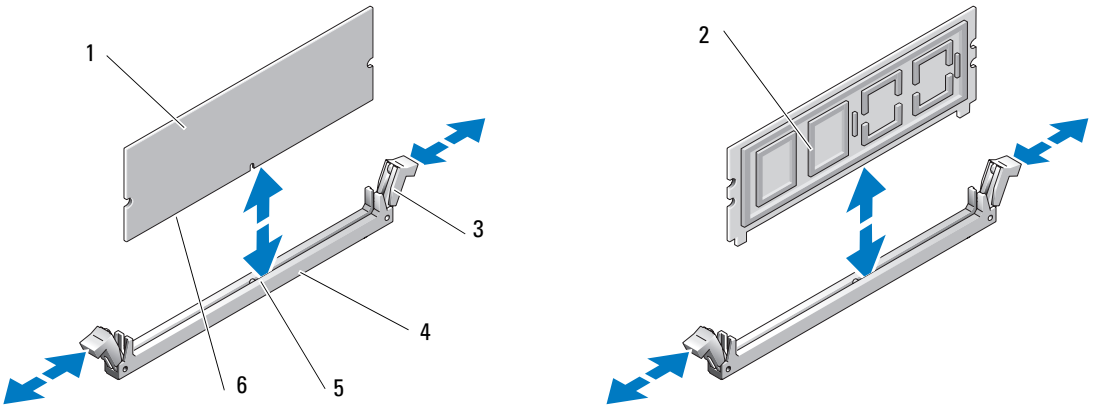
CAUTION: Only trained service technicians are authorized to remove the system cover and access any of the components inside the system. See your *Product Information Guide* for complete information about safety precautions, working inside the computer, and protecting against electrostatic discharge.

CAUTION: The memory modules are hot to the touch for some time after the system has been powered down. Allow time for the memory modules to cool before handling them. Handle the memory modules by the card edges and avoid touching the components.

1. Remove the server module. See "Removing a Server Module" on page 73.
2. Open the server module. See "Opening the Server Module" on page 75.
3. Locate the memory module sockets. See Figure 6-3.
4. Press the ejectors on the memory module socket down and out, as shown in Figure 3-16, to allow the memory module to be inserted into the socket. I

   If a memory module blank is installed in the socket, remove it. See Figure 3-16.

Figure 3-16. Installing and Removing a Memory Module or Memory Module Blank



1	memory module	2	memory module blank	3	memory module socket ejectors (2)
4	socket	5	alignment key	6	edge connector

5. Align the memory module's edge connector with the alignment key on the memory module socket, and insert the memory module in the socket.

   NOTE: The memory module socket has an alignment key that allows you to install the memory module in the socket in only one way.

6. Press down on the memory module with your thumbs while pulling up on the ejectors with your index fingers to lock the memory module into the socket.

   When the memory module is properly seated in the socket, the ejectors on the memory module socket align with the ejectors on the other sockets that have memory modules installed.

7. Repeat step 3 through step 6 of this procedure to install the remaining memory modules. See Table 3-2 for sample memory configurations.
8. Close the server module. See "Closing the Server Module" on page 76.
9. Install the server module. See "Installing a Server Module" on page 74.
10. (Optional) Press <F2> to enter the System Setup program, and check the **System Memory** setting on the main **System Setup** screen.

    The system should have already changed the value to reflect the newly installed memory.

11. If the value is incorrect, one or more of the memory modules may not be installed properly. Repeat step 1 through step 10 of this procedure, checking to ensure that the memory modules are firmly seated in their sockets.
12. Run the system memory test in the system diagnostics. See"Running System Diagnostics" on page 117.

Removing Memory Modules

CAUTION: Only trained service technicians are authorized to remove the system cover and access any of the components inside the system. See your *Product Information Guide* for complete information about safety precautions, working inside the computer, and protecting against electrostatic discharge.

CAUTION: The DIMMs are hot to the touch for some time after the system has been powered down. Allow time for the DIMMs to cool before handling them. Handle the DIMMs by the card edges and avoid touching the DIMM components.

1. Remove the server module. See "Removing a Server Module" on page 73.
2. Open the server module. See "Opening the Server Module" on page 75.
3. Locate the memory module sockets. See Figure 6-3.
4. Press down and out on the ejectors on each end of the socket until the memory module pops out of the socket. See Figure 3-16.
5. Close the server module. See "Closing the Server Module" on page 76.
6. Install the server module. See "Installing a Server Module" on page 74.

I/O Module Daughter Card

The server module board daughter-card connectors support a variety of dual-channel I/O module daughter cards, including a TCP/IP Offload Engine (TOE) NIC daughtercard.

- If installed, the daughter card must be used in conjunction with its appropriate back-panel I/O module and connector number.

  For example, server module number 5 must have a Fibre Channel daughter card installed to communicate with the Fibre Channel pass-through module connector number 5 (primary and secondary bays).

- You cannot install daughter cards of different fabric types within a system.

For more information on I/O module daughter cards, see "Guidelines for Installing Connectivity Modules" on page 28.

Installing a Daughter Card

CAUTION: Many repairs may only be done by a certified service technician. You should only perform troubleshooting and simple repairs as authorized in your product documentation, or as directed by the online or telephone service and support team. Damage due to servicing that is not authorized by Dell is not covered by your warranty. Read and follow the safety instructions that came with the product.

1. Remove the server module. See "Removing a Server Module" on page 73.
2. Open the server module. See "Opening the Server Module" on page 75.

NOTICE: Hold the daughter card by its edges only.

3. Align the three screw holes on the daughter card with the three standoffs on the server module board. See Figure 3-17.

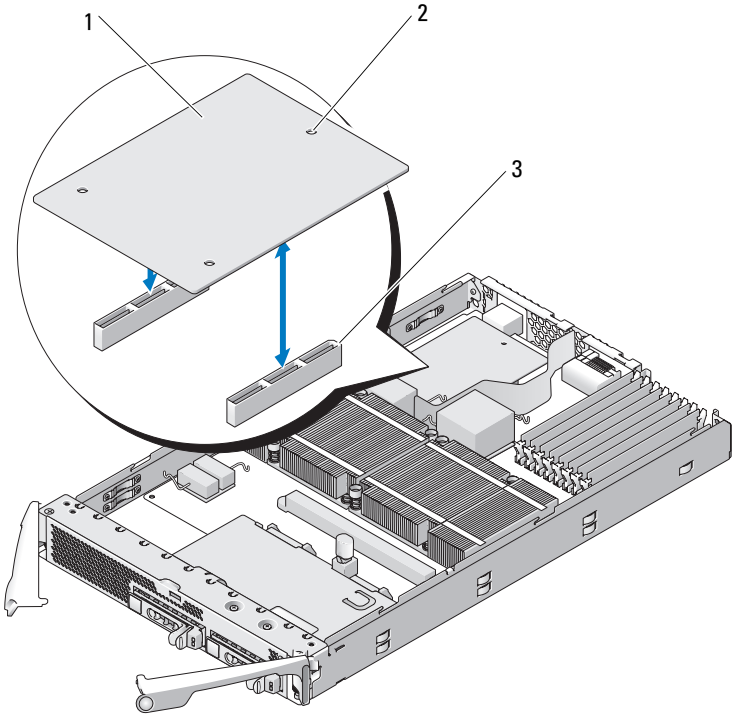
4 Align the connectors on the bottom of the daughter card with the connectors on the server module board, and then press down on the card edges until it is fully seated.

5 Secure the daughter card to the server module board with the three screws.

6 Close the server module. See "Closing the Server Module" on page 76.

7 Install the server module. See "Installing a Server Module" on page 74.

Figure 3-17. Installing and Removing a Daughter Card



1	daughter card	2	screw holes (3)	3	daughter card connectors on server module board (2)

Removing a Daughter Card

CAUTION: Only trained service technicians are authorized to remove the system cover and access any of the components inside the system. See your *Product Information Guide* for complete information about safety precautions, working inside the computer, and protecting against electrostatic discharge.

1 Remove the server module. See "Removing a Server Module" on page 73.

2 Open the server module. See "Opening the Server Module" on page 75.

3 Remove the three screws that secure the daughter card to the server module board. See Figure 3-17.

NOTICE: Hold the daughter card by its edges only.

4 Lift up the daughter card from its connector and remove it from the server module board.

5 Close the server module. See "Closing the Server Module" on page 76.

6 Install the server module. See "Installing a Server Module" on page 74.

Activating the Integrated NIC TOE

To add TOE functionality to the server module's integrated NIC, install the TOE NIC hardware key in the TOE_KEY socket on the system board (see Figure 6-3.) Both single-port and dual-port TOE hardware keys are available.

NOTICE: In a NIC team, a dual-port TOE hardware key is required.

Processors

It is possible to upgrade your processor(s) to take advantage of future options in speed and functionality. Each processor and its associated internal cache memory are contained in a land grid array (LGA) package that is installed in a ZIF socket on the system board.

Removing a Processor

CAUTION: Only trained service technicians are authorized to remove the system cover and access any of the components inside the system. See your *Product Information Guide* for complete information about safety precautions, working inside the computer, and protecting against electrostatic discharge.

1 Remove the server module. See "Removing a Server Module" on page 73.

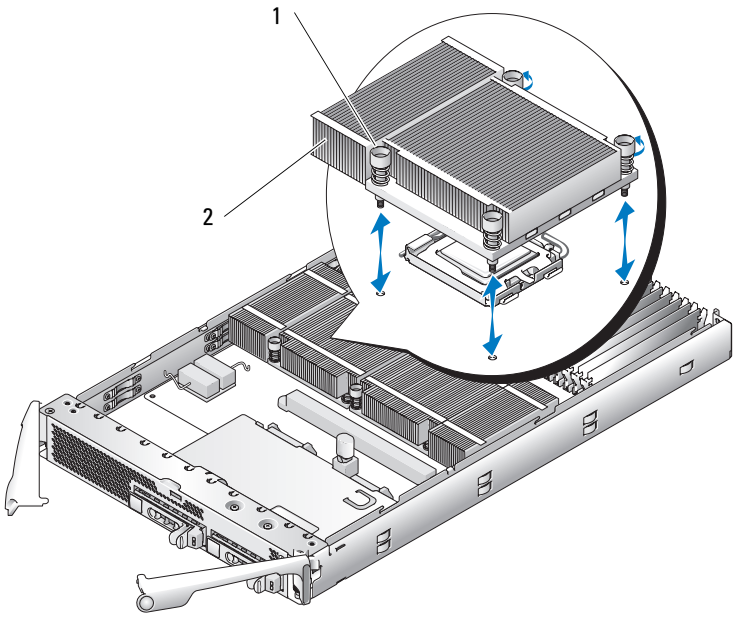
2 Open the server module. See "Opening the Server Module" on page 75.

CAUTION: The processor and heat sink can become extremely hot. Be sure the processor has had sufficient time to cool before handling.

NOTICE: Never remove the heat sink from a processor unless you intend to remove the processor. The heat sink is necessary to maintain proper thermal conditions.

3 Loosen the four screws that secure the heat sink to the server module board. See Figure 3-18.

Figure 3-18. Installing and Removing the Heat Sink



1 screws (4) 2 heat sink

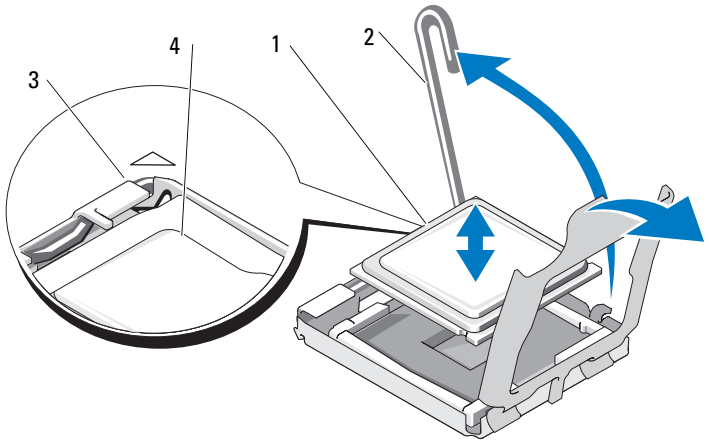
NOTE: When removing the heat sink, the possibility exists that the processor might adhere to the heat sink and be removed from the socket. It is recommended that you remove the heat sink while the processor is still warm.

4 Remove the heat sink:

- **a** Slightly rotate the heat sink to loosen it from the processor.
- **b** If the processor is removed from the socket with the heat sink, twist or slide the processor off of the heat sink. Do not pry the processor off of the heat sink.
- **c** Set the heat sink on its top so as not to contaminate the thermal grease.

5 Pull the socket-release lever straight up until the processor is released from the socket. See Figure 3-19.

Figure 3-19. Installing and Removing the Processor



1 processor 2 socket-release lever 3 pin-1 corner of socket

4 pin-1 corner of processor

6 Lift the processor out of the socket and leave the release lever up so that the socket is ready for the new processor.

NOTICE: Be careful not to bend any of the pins on the LGA socket when removing the processor. Bending the pins can permanently damage the socket and system board.

Installing a Processor

CAUTION: Only trained service technicians are authorized to remove the system cover and access any of the components inside the system. See your *Product Information Guide* for complete information about safety precautions, working inside the computer, and protecting against electrostatic discharge.

1 Prior to upgrading your system, download the latest system BIOS version on **support.dell.com**.

2 Unpack the new processor.

3 If you are adding a second processor, remove the processor blank by loosening the two screws securing the blank to the system board.

4 Align the pin-1 corner of the processor with the pin-1 corner of the ZIF socket. See Figure 3-19.

NOTE: Identifying the pin-1 corners is critical to positioning the processor correctly.

Identify the pin-1 corner of the processor by locating the tiny gold triangle on one corner of the processor. Place this corner in the same corner of the ZIF socket identified by a corresponding triangle on the system board.

5 Install the processor in the socket.

NOTE: If you are installing just one processor, it must be installed in socket CPU_1. See Figure 6-3.

NOTICE: Positioning the processor incorrectly can permanently damage the processor and the system board when you turn it on. Be careful not to bend the pins on the LGA socket.

a If the release lever on the processor socket is not positioned all the way up, move it to that position.

b With the pin-1 corners of the processor and socket aligned, set the processor lightly in the socket.

Because the system uses a ZIF processor socket, do not use force.

When the processor is positioned correctly, it drops down into the socket with minimal pressure.

c When the processor is fully seated in the socket, rotate the socket release lever back down until it snaps into place, securing the processor.

6 Install the heat sink:

a *If you are reinstalling a heat sink*, use a clean lint-free cloth to remove the existing thermal grease from the heat sink.

If you are reinstalling a processor, also clean any remnants of thermal grease from the processor.

b Apply thermal grease evenly to the top of the processor.

c Place the heat sink onto the processor. See Figure 3-18.

d Tighten the four screws to secure the heat sink to the server module board. See Figure 3-18.

7 Close the server module. See "Closing the Server Module" on page 76.

8 Install the server module. See "Installing a Server Module" on page 74.

As the system boots, it detects the presence of the new processor and automatically changes the system configuration information in the System Setup program.

9 Press <F2> to enter the System Setup program, and check that the processor information matches the new system configuration.

See "Using the System Setup Program" on page 43 for instructions about using the System Setup program.

10 Run the system diagnostics to verify that the new processor operates correctly.

See "Running System Diagnostics" for information about running the diagnostics and troubleshooting processor problems.

11 If you have upgraded the processor, update the system BIOS.

Server Module Battery

The system battery is a 3.0-volt (V), coin-cell battery.

Removing and Installing the Server Module Battery

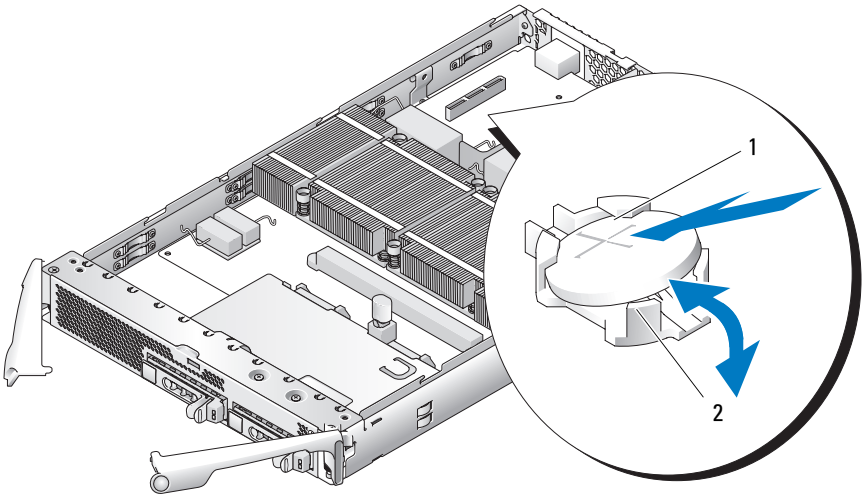
CAUTION: Only trained service technicians are authorized to remove the system cover and access any of the components inside the system. See your *Product Information Guide* for complete information about safety precautions, working inside the computer, and protecting against electrostatic discharge.

CAUTION: There is a danger of a new battery exploding if it is incorrectly installed. Replace the battery only with the same or equivalent type recommended by the manufacturer. Discard used batteries according to the manufacturer's instructions. See your *Product Information Guide* for additional information.

1. Remove the server module. See "Removing a Server Module" on page 73.
2. Open the server module. See "Opening the Server Module" on page 75.
3. If a daughter card is installed on the server module board, remove the daughter card. See "Removing a Daughter Card" on page 83.
4. Remove the system battery by lifting it straight up from its connector. See Figure 3-20.

   See Figure 6-3 to locate the system battery on the server module board.
5. Install the new system battery with the side labeled "+" facing toward the inside of the server module. See Figure 3-20.

Figure 3-20. Replacing the System Battery



1 "+" side of battery 2 battery connector

6 If you removed a daughter card from the server module board, reinstall it. See "Installing a Daughter Card" on page 82.

7 Close the server module. See "Closing the Server Module" on page 76.

8 Install the server module. See "Installing a Server Module" on page 74.

9 Enter the System Setup program to confirm that the battery is operating properly. See "Using the System Setup Program" in your *User's Guide*.

10 Enter the correct time and date in the System Setup program's **Time** and **Date** fields.

11 Exit the System Setup program.

12 To test the newly installed battery, remove the server module for at least an hour. See "Removing a Server Module."

13 After an hour, install the server module. See "Installing a Server Module."

14 Enter the System Setup program and if the time and date are still incorrect, see "Getting Help" for instructions about obtaining technical assistance.

Hard Drives

Each server module supports one or two hot-pluggable SAS *or* one or two hot-pluggable SATA hard drives. If only one hard drive is used, a blank must be installed to maintain proper cooling. The hard drive bays are located on the front panel of the server module. Each hard drive has indicators that provide hard drive activity and status information.

NOTICE: You cannot install a SAS drive and a SATA drive within a given server module (blade). However, you can install server modules (blades) with SAS drives and server modules with SATA drives in the same server enclosure.

Integrated Mirroring of Hard Drives

The controller on the server module board supports integrated mirroring if two drives are installed. After installing the drives, see your *Configuration Guide* to enable and configure your RAID array.

Installing a Previously Arrayed Hard Drive Into a SAS-Mode Server Module

A hard drive previously installed in a RAID configuration contains partial segments of information referred to as "meta-data." If you hot-install a hard drive that contains meta-data into a SAS-mode server module, its array may appear as degraded after the server module is rebooted.

CAUTION: Do not attempt to rebuild the degraded array in a SAS-mode server module. The server module can accommodate up to two hard drives, one of which is the primary physical boot hard drive. Rebuilding the array could result in loss of data from the primary hard drive.

To remove the meta-data from the replacement hard drive, perform the following steps:

1 Back up all data onto the replacement hard drive.

2 Restart the server module and press <Ctrl><C> to run the RAID configuration utility.

3 Change the degraded array properties from mirror to SAS mode by selecting **NO** as the **Mirror** option.

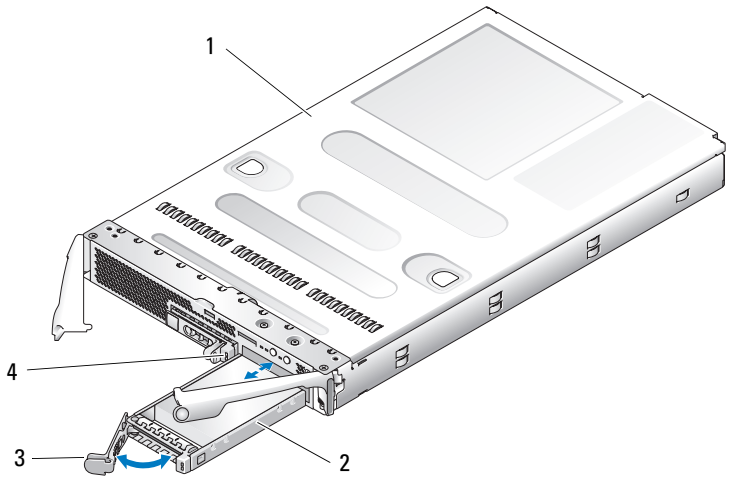
Installing a Hard Drive

NOTICE: When a replacement hot-pluggable hard drive is installed and the server module is powered on, the hard drive automatically begins to rebuild. Make absolutely sure that the replacement hard drive is blank or contains data that you wish to have over-written. Any data on the replacement hard drive is immediately lost after the hard drive is installed.

NOTICE: Not all operating systems support hot-plug drive installation. See the documentation supplied with your operating system.

1 Open the hard-drive carrier handle. See Figure 3-21.

Figure 3-21. Installing a Hard Drive



1 server module 2 hard drive 0 3 carrier handle

4 hard drive 1

2 Insert the hard-drive carrier into the drive bay.

3 Close the hard-drive carrier handle to lock it in place.

Removing a Hard Drive

NOTICE: Not all operating systems support hot-plug drive installation. See the documentation supplied with your operating system.

1 Take the hard drive offline and wait until the hard-drive indicator codes on the drive carrier signal that the drive may be removed safely. See Figure 1-4.

When all indicators are off, the drive is ready for removal.

See your operating system documentation for more information on taking the hard drive offline.

2 Open the hard-drive carrier handle to release the drive. See Figure 3-21.

3 Slide the hard drive out until it is free of the drive bay.

If you are permanently removing the hard drive, install a blank insert.

Shutdown Procedure for Servicing a Hard Drive

NOTE: This section applies only to situations where the server module must be powered down to service a hard drive. In many situations, the hard drive can be serviced while the server module powered on.

If you need to power off the server module to service a hard drive, wait 30 seconds after the server module's power indicator turns off before removing the hard drive. Otherwise, the hard drive may not be recognized after the hard drive is reinstalled and the server module is powered on again.

Configuring the Boot Drive

The drive or device from which the system boots is determined by the boot order specified in the System Setup program (see "Using the System Setup Program" on page 43.

Removing a Hard Drive From a Hard-Drive Carrier

Remove the four screws from the slide rails on the hard-drive carrier and separate the hard drive from the carrier.

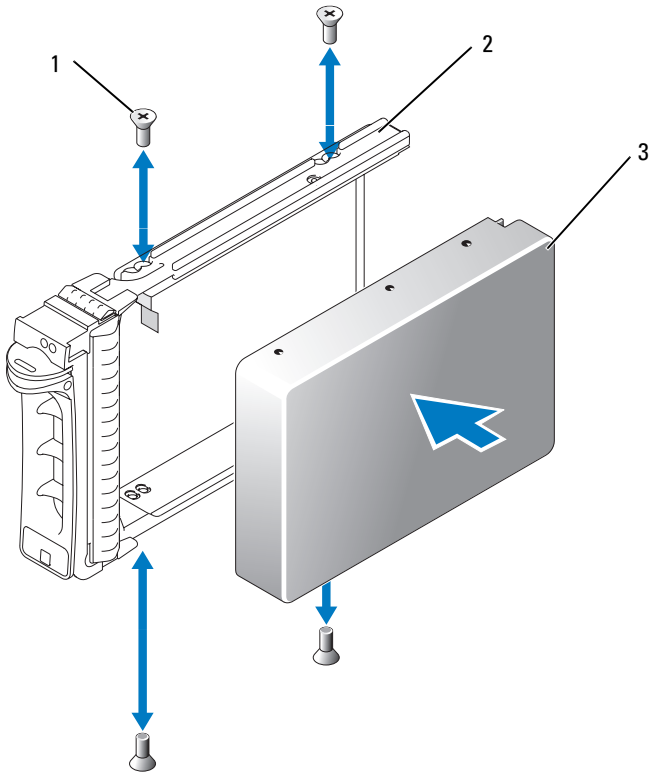
Installing a Hard Drive Into a Drive Carrier

1 Insert the hard drive into the hard-drive carrier with the connector end of the drive at the rear. See Figure 3-22.

2 Align the screw holes on the hard drive with the holes on the hard-drive carrier. See Figure 3-22.

3 Attach the four screws to secure the hard drive to the hard-drive carrier. See Figure 3-22.

Figure 3-22. Installing a Hard Drive Into a Drive Carrier



1 screws (4) 2 drive carrier 3 hard drive

Back-Panel Module Cage Assembly (Service-Only Procedure)

Removing the Back-Panel Module Cage Assembly

CAUTION: Only trained service technicians are authorized to remove the system cover and access any of the components inside the system. See your *Product Information Guide* for complete information about safety precautions, working inside the computer, and protecting against electrostatic discharge.

1. Press the system power switch to turn off the system. See "System Status Features" on page 10.
2. Remove all of the server modules. See "Removing a Server Module" on page 73.
3. Remove the power supply modules. See "Removing a Power Supply Module" on page 58.
4. Remove the fan modules. See "Removing a Fan" on page 60.
5. Remove the DRAC/MC module. See "Removing a DRAC/MC Module" on page 61.

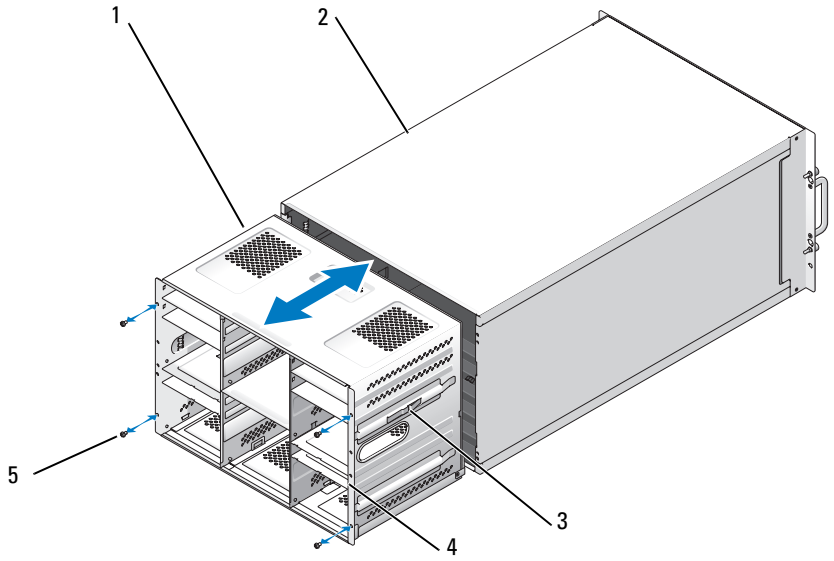
6 Remove the KVM module. See "Removing a KVM Module" on page 63.

7 Remove the I/O modules. See "Removing an I/O Module" on page 71.

8 Remove the four screws securing the module cage assembly to the chassis back panel. See Figure 3-23.

9 Pull the assembly out of the chassis approximately half way until it stops, press the two side levers on the sides of the cage, and then pull the cage out from the chassis. See Figure 3-23.

Figure 3-23. Removing and Installing the Back-Panel Module Cage Assembly



1	module cage assembly	2	chassis	3	side levers (2)
4	back rails (2)	5	screws (4)		

Installing the Back-Panel Module Cage Assembly

CAUTION: Only trained service technicians are authorized to remove the system cover and access any of the components inside the system. See your *Product Information Guide* for complete information about safety precautions, working inside the computer, and protecting against electrostatic discharge.

1 Insert the module-cage assembly into the back of the chassis and push the assembly in until the back rails are flush against the chassis back panel. See Figure 3-23.

2 Install the four screws to secure the module cage assembly to the chassis back panel.

3 Install the I/O modules. See "Installing an I/O Module" on page 72.

4 Install the KVM module. See "Installing a KVM Module" on page 63.

5 Install the DRAC/MC module. See "Installing a DRAC/MC Module" on page 62.

6 Install the fan modules. See "Installing a Fan" on page 61.

7 Install the power supply modules. See "Installing a Power Supply Module" on page 59.

8 Install the server modules. See "Installing a Server Module" on page 74.

9 Press the system power switch to turn on the system.

Chassis Control Panel Assembly (Service-Only Procedure)

Removing the Chassis Control Panel

CAUTION: Only trained service technicians are authorized to remove the system cover and access any of the components inside the system. See your *Product Information Guide* for complete information about safety precautions, working inside the computer, and protecting against electrostatic discharge.

1 Press the system power switch to turn off the system. See "System Status Features" on page 10.

2 Remove the server modules nearest the system control panel. See "Removing a Server Module" on page 73.

3 Remove the chassis control panel:

   a From the front of the chassis, slightly lift up the securing tab on the back of the control panel. See Figure 3-24.

   b Slide the control panel slightly backward and remove it from its bay.

4 Remove the control-panel midplane receptacle:

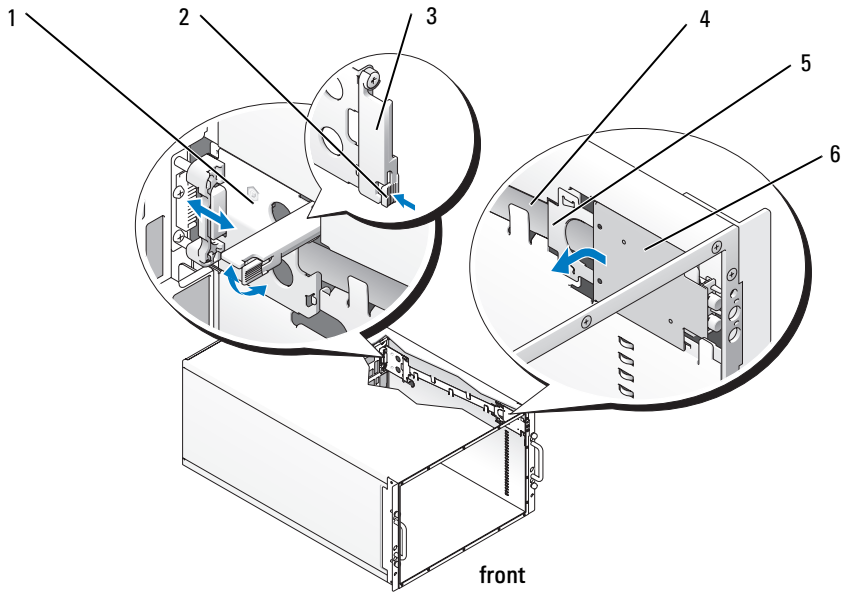
   a From the front of the chassis, press in the securing-arm release button and lift up the securing arm.

   b Pull out the control-panel midplane receptacle from its bay.

5 Remove the control-panel cable from its retaining clips.

6 Remove the control panel assembly from the chassis.

Figure 3-24. Removing and Installing the Chassis Control Panel Assembly



1	midplane receptacle	2	securing-arm release button	3	securing arm
4	control-panel cable	5	control-panel securing tab	6	control panel

Installing the Chassis Control Panel

CAUTION: Only trained service technicians are authorized to remove the system cover and access any of the components inside the system. See your *Product Information Guide* for complete information about safety precautions, working inside the computer, and protecting against electrostatic discharge.

1. Place the control-panel cable in its retaining clips. See Figure 3-24.
2. Install the control-panel midplane receptacle:
   a. Ensure that the securing arm on the control-panel midplane receptacle is open.
   b. Place the control-panel midplane receptacle into its bay and push it forward until it is fully seated.
   c. Lower the securing arm on the control-panel midplane receptacle until it locks in place.
3. Install the chassis control panel assembly:
   a. Place the control panel in its bay so it lays flat.
   b. Slide the control panel forward until its securing tab locks in place.

Server Module Control Panel Assembly (Service-Only Procedure)

Removing the Server Module Control Panel

CAUTION: Only trained service technicians are authorized to remove the system cover and access any of the components inside the system. See your *Product Information Guide* for complete information about safety precautions, working inside the computer, and protecting against electrostatic discharge.

1. Turn off the server module.

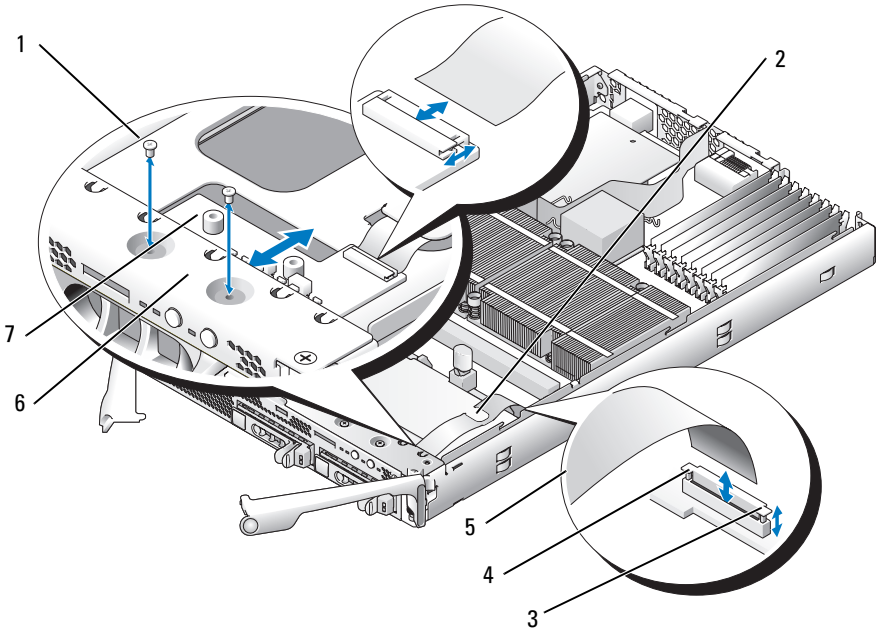
   If the power switch on the control panel is still operational, press the power switch to turn off the server module. See "System Status Features" on page 10.

   If the server module power switch is not operational, power down the server using its remote power-down capability. See the *Dell Remote Access Controller/Modular Chassis User's Guide* for information on using the remote management features of the system

2. Remove the server module from the system chassis. See "Removing a Server Module" on page 73.
3. Open the server module. See "Opening the Server Module" on page 75.
4. Remove the two screws that secure the control panel to the server module top bracket and pull out the control panel to remove it. See Figure 3-25.
5. Remove the control-panel cable from the server module-board connector:
   a. Pull up the retaining clip on top of the connector.
   b. Lift up on the control panel cable to remove it from the server module-board connector.

   NOTE: The control panel cable attaches to the connector on the control panel in the same manner.

Figure 3-25. Removing and Installing the Server Module Control Panel Assembly



1	screws (2)	2	control panel cable retaining clip	3	retaining clip
4	server module-board connector	5	control panel cable	6	top bracket
7	control panel				

Installing the Server Module Control Panel

1. Place the new control panel under the server module top bracket and secure it with the two screws. See Figure 3-25.
2. Route the control-panel cable under its retaining clip.
3. Connect the control-panel cable to the server module-board connector:
   a. Pull up the retaining clip on top of the connector.
   b. Slip the cable between the retaining clip and the connector and press down on the clip to secure the cable.

   NOTE: The cable attaches to the connector on the control panel in the same manner.
4. Close the server module. See "Closing the Server Module" on page 76.
5. Install the server module. See "Installing a Server Module" on page 74.

System Board (Service-Only Procedure)

Removing the System Board

CAUTION: Only trained service technicians are authorized to remove the system cover and access any of the components inside the system. See your *Product Information Guide* for complete information about safety precautions, working inside the computer, and protecting against electrostatic discharge.

1. Remove the server module. See "Removing a Server Module" on page 73.
2. Open the server module. See "Opening the Server Module" on page 75.

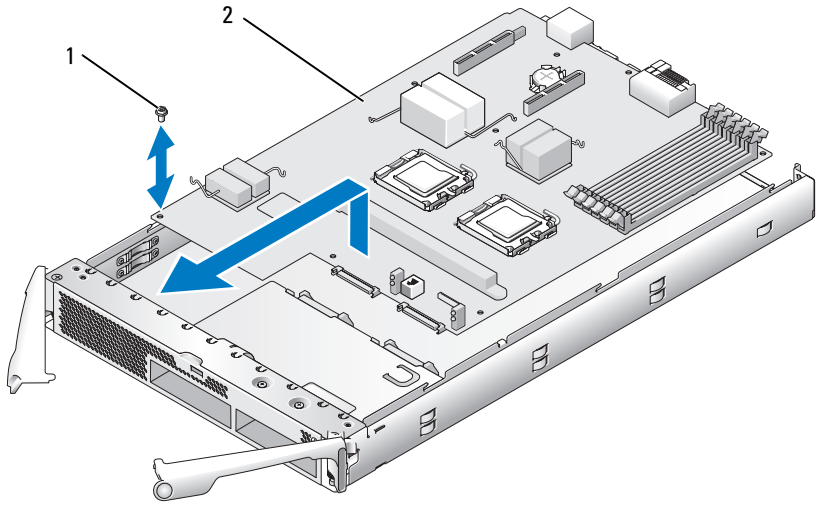
CAUTION: The processor and heat sink can become extremely hot. Be sure the processor has had sufficient time to cool before handling.

CAUTION: The memory modules are hot to the touch for some time after the system has been powered down. Allow time for the memory modules to cool before handling them. Handle the memory modules by the card edges and avoid touching the components.

NOTICE: If you are removing two hard drive, label them so you can replace them in their original locations.

3. Remove the hard drives. See "Removing a Hard Drive" on page 90.
4. Disconnect the control panel cable from the system board. See Figure 3-25.
5. If applicable, remove the daughter card See "Removing a Daughter Card" on page 83.
6. Remove the memory modules and memory module blanks. See "Removing Memory Modules" on page 82.
7. Remove the processor(s). See "Removing a Processor" on page 84.
8. Remove the five Phillips screws and three hexagonal screws securing the system board to the server module chassis.
9. Remove the curved chipset cooling shroud near the memory module sockets.
10. Lift the system board out of the chassis.

Figure 3-26. Removing and Installing the System Board



1 screws (8) 2 system board

Installing the System Board

CAUTION: Only trained service technicians are authorized to remove the system cover and access any of the components inside the system. See your *Product Information Guide* for complete information about safety precautions, working inside the computer, and protecting against electrostatic discharge.

1. Carefully lower the new system board into the chassis.
2. Reinstall the five Phillips screws and three hexagonal screws.

   Use the center screw near the back edge of the board to reinstall the chipset cooling shroud.
3. Replace the processor(s). See "Installing a Processor" on page 86.
4. Replace the memory modules and memory module blanks. See "Installing Memory Modules" on page 80.
5. If applicable, replace the daughter card See "Installing a Daughter Card" on page 82.
6. Reconnect the control panel cable to the system board. See Figure 3-25.
7. Replace the hard drive(s).

   If you are installing two drives, be sure and reinstall them in their original locations.
8. Close the server module. See "Closing the Server Module" on page 76.
9. Install the server module in the system. See "Installing a Server Module" on page 74.

4

Troubleshooting Your System

Safety First—For You and Your System

To perform certain procedures in this document, you must remove the system cover and work inside the system. While working inside the system, do not attempt to service the system except as explained in this guide and elsewhere in your system documentation.

CAUTION: Many repairs may only be done by a certified service technician. You should only perform troubleshooting and simple repairs as authorized in your product documentation, or as directed by the online or telephone service and support team. Damage due to servicing that is not authorized by Dell is not covered by your warranty. Read and follow the safety instructions that came with the product.

Start-Up Routine

Look and listen during the system's start-up routine for the indications described in Table 4-1.

Table 4-1. Start-Up Routine Indications

Look/listen for:	Action
An error message displayed on the monitor	See "Server Module Messages" on page 34.
Alert messages from the systems management software	See the systems management software documentation.
The monitor's power indicator	See "Troubleshooting the Video Subsystem" on page 102.
The keyboard indicators	See "Troubleshooting the Keyboard" on page 103.
The USB diskette drive activity indicator	See "Troubleshooting USB Devices" on page 105.
The USB optical drive activity indicator	See "Troubleshooting USB Devices" on page 105.
The hard-drive activity indicator	See "Troubleshooting Hard Drives" on page 113.
An unfamiliar constant scraping or grinding sound when you access a drive	See "Getting Help" on page 127.

Checking the Equipment

This section provides troubleshooting procedures for external devices attached to the system, such as the monitor, keyboard, or mouse. Before you perform any of the procedures, see "Troubleshooting External Connections" on page 102.

Troubleshooting External Connections

Loose or improperly connected cables are the most likely source of problems for the system, monitor, and other peripherals (such as a printer, keyboard, mouse, or other external device). Ensure that all external cables are securely attached to the external connectors on your system. See Figure 1-3 for the front-panel connectors on your system and Figure 1-5 for the back-panel connectors.

Troubleshooting the Video Subsystem

Problem

- Monitor or monitor cable
- Keyboard/video/mouse (KVM) custom cable
- KVM module
- Server module

Action

1. Ensure that the server module(s) is turned on.
2. Check the monitor connection to the custom cable.

   Try swapping monitor cables if another monitor cable is available.
3. Check the custom cable connection to either the front-panel custom-cable connector on the server module or the back-panel KVM module.
4. If the monitor does not function from the back-panel KVM module, ensure that the KVM selection indicator on the front panel of the server module is green. If not, press the KVM selection button. See Figure 1-3.

   NOTE: See "KVM Modules" on page 22 for instructions on how to select a server module from the keyboard connected to the KVM module.

5 If two or more server modules are installed in the chassis, press the KVM selection button on a different server module.

NOTE: After pressing the KVM selection button, allow approximately two seconds for the KVM functions to change to a different server module.

If the monitor is connected to the back-panel KVM module and works with another server module, the first server module may need to be reseated. See "Server Modules" on page 73. If reseating the server module does not help, the server module may be faulty. See "Getting Help" on page 127.

6 Swap the monitor with a known-working monitor and repeat step 4 and step 5.

If the monitor does not work when connected to either the front-panel custom cable or to the back-panel custom cable, the server module may be faulty. See "Getting Help" on page 127.

If the monitor works in the back-panel custom cable and not the front-panel custom cable, the front-panel custom cable may be faulty. See "Getting Help" on page 127.

If the monitor works in the front-panel custom cable and not the back-panel custom cable, the KVM module or the back-panel custom cable may be faulty. See "Getting Help" on page 127.

Troubleshooting the Keyboard

NOTE: USB keyboard devices can be connected only to the front-panel custom cable, and PS/2 keyboard devices can be connected only to the back-panel custom cable.

Problem

- A symptom of a keyboard problem is indicated by a system message
- Keyboard or keyboard cable
- Keyboard/Video/Mouse (KVM) custom cable
- KVM module
- Server module

Action

1 Ensure that the server module(s) is turned on.

2 Check the keyboard connection to the custom cable.

3 Check the custom cable connection to either the front-panel custom cable connector on the server module or to the back-panel KVM module.

4 If you are connecting a keyboard to the front-panel custom cable connector, test the keyboard and front-panel custom cable on a different server module, if available.

5 If the keyboard does not function from the back-panel KVM module, ensure that the KVM selection indicator on the front panel of the server module is green. If not, press the KVM selection button. See Figure 1-3.

6 If two or more server modules are installed in the chassis, press the KVM selection button on a different server module.

NOTE: After pressing the KVM selection button, allow approximately two seconds for the KVM functions to change to a different server module.

If the keyboard is connected to the back-panel KVM module and works with another server module, the first server module may need to be reseated. See "Server Modules" on page 73. If reseating the server module does not help, the server module may be faulty. See "Getting Help" on page 127.

7 Swap the keyboard with a known-working keyboard and repeat step 5 and step 6. If the keyboard does not work with any server module, see "Getting Help" on page 127.

Troubleshooting the Mouse

NOTE: USB mouse devices can be connected only to the front-panel custom cable and PS/2 mouse devices can be connected only to the back-panel custom cable.

Problem

- A symptom of a mouse problem is indicated by a system message
- Mouse or mouse cable
- Keyboard/Video/Mouse (KVM) custom cable
- Server module

Action

1 Ensure that the server module(s) is turned on.

2 Check the mouse connection to the custom cable

3 Check the custom cable connection to the either the front-panel custom cable connector on the server module or to the back-panel KVM module.

4 If you are connecting a mouse to the front-panel custom cable connector, test the mouse and front-panel custom cable on a different server module, if available.

5 If the mouse does not function from the back-panel KVM module, ensure that the KVM selection indicator on the front panel of the server module is green. If not, press the KVM selection button. See Figure 1-3.

NOTE: See "KVM Modules" on page 22 for instructions on how to select a server module from the keyboard connected to the KVM module.

6 If two or more server modules are installed in the chassis, press the KVM selection button on a different server module.

NOTE: After pressing the KVM selection button, allow approximately two seconds for the KVM functions to change to a different server module.

If the mouse is connected to the back-panel KVM module and works with another server module, the first server module may need to be reseated. See "Server Modules" on page 73. If reseating the server module does not help, the server module may be faulty. See "Getting Help" on page 127.

7 Swap the mouse with a known-working mouse and repeat step 5 and step 6. If the mouse does not work with any server module, see "Getting Help" on page 127.

Troubleshooting USB Devices

NOTE: USB devices can be connected only to the front-panel custom cable. Total length of a USB cable should not exceed 3 m (9.8 ft).

Problem

- A symptom of a USB problem is indicated by a system message
- USB device or USB device cable
- Keyboard/Video/Mouse (KVM) custom cable
- Server module

Action

1 Ensure that the server module(s) is turned on.

2 Check the USB device connection to the front-panel custom cable.

3 Check the custom cable connection to the front-panel custom-cable connector.

4 Swap the USB device with a known-working USB device.

5 If another server module is installed, connect the USB device to that server module. If the USB device works with a different server module, the first server module may be faulty. See "Getting Help" on page 127.

Responding to a Systems Management Alert Message

The Dell™ Remote Access Controller/Modular Chassis (DRAC/MC) management applications monitor critical system voltages and temperatures, and the cooling fans in the system. For information about the DRAC/MC alert messages, see the *Configuration Guide*.

Troubleshooting a Wet System

Problem

- Liquid spills
- Splashes
- Excessive humidity

Action

CAUTION: Many repairs may only be done by a certified service technician. You should only perform troubleshooting and simple repairs as authorized in your product documentation, or as directed by the online or telephone service and support team. Damage due to servicing that is not authorized by Dell is not covered by your warranty. Read and follow the safety instructions that came with the product.

1. Turn off the system.
2. Disconnect the power supplies from the electrical outlets.

CAUTION: Wait until all of the indicators on the power supplies turn off before preceding.

3. Remove all the server modules. See "Removing a Server Module" on page 73.
4. Remove the DRAC/MC module. See "Removing a DRAC/MC Module" on page 61.
5. Remove all I/O modules installed in the system. See "Removing an I/O Module" on page 71.
6. Remove all the fan modules. See "Installing a Fan" on page 61.
7. Remove all the power supply modules. See "Removing a Power Supply Module" on page 58.
8. Let the system dry thoroughly for at least 24 hours.
9. Install all the power supply modules. See "Installing a Power Supply Module" on page 59.
10. Install all the fan modules. See "Installing a Fan" on page 61.
11. Install all the I/O modules in the system. See "Installing an I/O Module" on page 72.
12. Install the DRAC/MC module. See "Installing a DRAC/MC Module" on page 62.
13. Install all the server modules. See "Installing a Server Module" on page 74.
14. Reconnect the power supply modules to their electrical outlets.

    If the system does not start up properly, see "Getting Help" on page 127.

15 Run the Server Administrator diagnostics to confirm that the system is working properly (see "Running System Diagnostics").

If the tests fail, see "Getting Help" on page 127.

Troubleshooting a Damaged System

Problem

- System was dropped or damaged

Action

1 Ensure that the following components are properly installed and connected:
   - DRAC/MC module
   - I/O modules
   - Power supply modules
   - Fan modules
   - Server modules
2 Ensure that all cables are properly connected.
3 Ensure that all components are properly installed and free from damage.
4 Run the online diagnostics. See ""Running System Diagnostics" on page 117."

If the tests fail, see "Getting Help" on page 127.

Troubleshooting System Components

The following procedures describe how to troubleshoot the following components:

- Power supply modules
- Fan modules
- DRAC/MC module
- Network switch module

Troubleshooting Power Supply Modules

Problem

- A power supply module is not operating properly

Action

NOTICE: The power-supply modules are hot-pluggable. Remove and replace only one power-supply module at a time in a system that is turned on. Leave a failed power-supply module installed in the chassis until you are ready to replace it. Operating the system with a power-supply module removed for extended periods of time can cause the system to overheat.

NOTE: The 2100-W power supply modules require 170-264 V to operate. If they are plugged into 110-V electrical outlets, the power supply modules do not power up.

1. Locate the faulty power supply module.

   The power supply's fault indicator is amber if AC power is available. See Figure 1-6.

   If no indicators are lit, ensure that AC power is available from the electrical outlet and that the power cable is properly connected to the power supply module.

2. Install a new power supply. See "Installing a Power Supply Module" on page 59.

   NOTE: After installing a new power supply, allow several seconds for the system to recognize the power supply and determine whether it is working properly. The power supply DC power indicator turns green if the power supply is functioning properly. See Figure 1-6.

3. If the problem is not resolved, see "Getting Help" on page 127. for information about obtaining technical assistance.

Troubleshooting Fan Modules

Problem

- A fan is not operating properly

Action

NOTICE: The fan modules are hot-pluggable. Remove and replace only one fan module at a time in a system that is turned on. Operating the system with a fan module removed for extended periods of time can cause the system to overheat.

1. Locate the faulty fan.

   Each fan module has indicators that identify a faulty fan. See Figure 1-7.

2. Reseat the faulty fan. See "Fan Modules" on page 59.
3. If the problem is not resolved, install a new fan.
4. If the new fan does not operate, see "Getting Help" on page 127.

Troubleshooting the DRAC/MC Module

Problem

- DRAC/MC module is not operating properly
- System message indicates a problem with the DRAC/MC module
- DRAC/MC module cable connections

Action

NOTE: To eliminate the possibility of a hardware problem with the module or its attaching devices, first ensure that the module is properly initialized and configured. See the *Configuration Guide* and the documentation that came with the module before performing the following procedure.

1. Reseat the DRAC/MC module and see if the DRAC/MC module fault indictor turns off. See "DRAC/MC Module" on page 61. See Figure 1-10 for more information about the module's indicators.
2. If another DRAC/MC module is available, swap the two modules.
3. If the fault indicator is off, but the serial device connected to the serial port is not properly operating, go to step 4. If the fault indicator is off, but the network management device connected to the network interface connector port is not properly operating, go to step 8.
4. Ensure that the serial cable is a null modem cable.
5. Reseat the serial cable to the serial connector on the DRAC/MC module and to the serial device.
6. Connect a known-working null-modem serial cable between the DRAC/MC module and the serial device.
7. Connect a known-working serial device to the DRAC/MC module.

   If the serial device and DRAC/MC module still do not communicate with each other, see "Getting Help" on page 127.
8. Reseat the network cable to the network connector on the DRAC/MC module and to the network device.
9. Connect a known-working network cable between the DRAC/MC module and the network device.
10. Connect a known-working network device to the DRAC/MC module.

    If the network device and DRAC/MC module still do not communicate with each other, see "Getting Help" on page 127.

Troubleshooting a Network Switch Module

Problem

- System cannot communicate with the network
- Network cable connections
- Network switch module and hub configuration settings

Action

NOTE: To eliminate the possibility of a hardware problem with the module or its attaching devices, first ensure that the module is properly initialized and configured. See the *Configuration Guide* and the documentation that came with the module before performing the following procedure.

1. Check the appropriate indicator on the network switch module. See "I/O Connectivity" on page 28 for a description the indicators for each type of network switch module.
   - If the link indicator displays an error condition, check all cable connections.

     See "I/O Connectivity" on page 28 for the link indicator error conditions for your particular network switch module.
   - Try another connector on the external switch or hub.
   - If the activity indicator does not light, replace the network switch module. See "Chassis I/O Module" on page 70.
2. If the server module requires a daughter card for a particular network switch module, ensure that the appropriate daughter card is installed. If so, reseat the daughter card. See "I/O Module Daughter Card" on page 82.

   If the network link indicator on the server module is green, then the server module has a valid link to the appropriate network switch module.
3. Ensure that the appropriate drivers are installed and the protocols are bound.

Troubleshooting Server Module Components

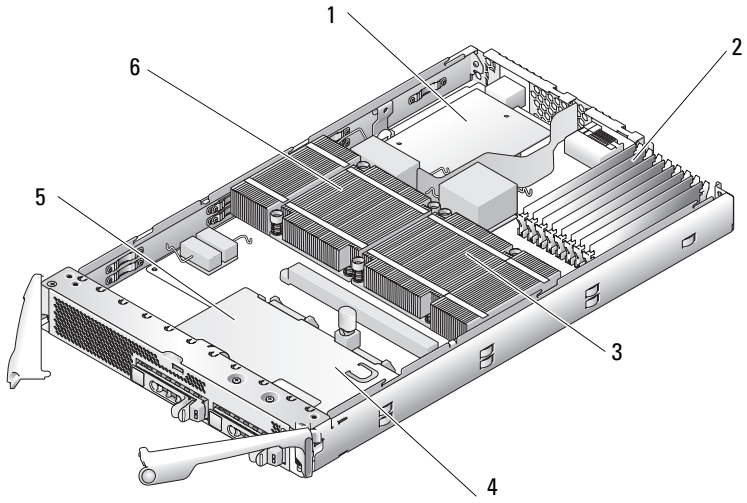
The following procedures describe how to troubleshoot the following components:

- Memory
- Hard drives
- Microprocessors
- Server module board
- Battery

Inside the Server Module

Figure 4-1 shows an interior view of the major components of the server module.

Figure 4-1. Inside the Server Module



1	optional I/O daughter card	2	memory modules	3	microprocessor 2
4	hard drive 0	5	hard drive 1	6	microprocessor 1

The server module board contains up to two microprocessors, eight memory modules, interface connectors for the hard drives, interface connectors for an optional daughter card, and a dual-Gigabit NIC. Up to two hard drives connect to a controller on the server module board. If two hard drives are installed, you have the option of enabling integrated mirroring. See the *Configuration Guide*. This feature enables you to have RAID 1 capabilities.

During an installation or troubleshooting procedure, you may be required to change a switch setting. For more information, see "Server Module Board DIP Switch" on page 122.

Troubleshooting Server Module Memory

Problem

- Faulty memory module
- Faulty server module board

Action

CAUTION: Many repairs may only be done by a certified service technician. You should only perform troubleshooting and simple repairs as authorized in your product documentation, or as directed by the online or telephone service and support team. Damage due to servicing that is not authorized by Dell is not covered by your warranty. Read and follow the safety instructions that came with the product.

NOTE: Before performing the following procedure, ensure that you have installed the memory modules according to the "General Memory Module Installation Guidelines" on page 78.

1. Restart the server module.
   a. Press the power button once to turn off the server module.
   b. Press the power button again to apply power to the server module.

   If no error messages appear, go to step 8.
2. Enter the System Setup program and check the system memory setting. See "Using the System Setup Program" on page 43.

   If the amount of memory installed matches the system memory setting, go to step 8.
3. Remove the server module. See "Removing a Server Module" on page 73.
4. Open the server module. See "Opening the Server Module" on page 75.
5. Reseat the memory modules in their sockets. See "Installing Memory Modules" on page 80.
6. Close the server module. See "Closing the Server Module" on page 76.
7. Install the server module. See "Installing a Server Module" on page 74.
8. Run the system memory test in the system diagnostics. See "Running System Diagnostics" on page 117.

   If the test fails, see "Getting Help" on page 127.

Troubleshooting Hard Drives

Problem

- Device driver error
- Improperly seated hard drive carrier
- Faulty hard drive or hard-drive carrier
- Device drivers

Action

CAUTION: Many repairs may only be done by a certified service technician. You should only perform troubleshooting and simple repairs as authorized in your product documentation, or as directed by the online or telephone service and support team. Damage due to servicing that is not authorized by Dell is not covered by your warranty. Read and follow the safety instructions that came with the product.

NOTICE: This troubleshooting procedure can destroy data stored on the hard drive. Before you proceed, back up all the files on the hard drive, if possible.

1. Run the appropriate controllers test and the hard drive tests in system diagnostics. See "Running System Diagnostics" on page 117.

   If the tests fail, continue to step 3.

2. Take the hard drive offline and wait until the hard-drive indicator codes on the drive carrier signal that the drive may be removed safely, then remove and reseat the drive carrier in the server module. See "Hard Drives" on page 89.
3. Restart your server module, enter the System Setup program, and confirm that the integrated drive controller is enabled. See "Integrated Devices Screen" on page 48.
4. Ensure that any required device drivers are installed and are configured correctly.

NOTICE: Installing a hard drive into another bay will break the mirror if the mirror state is optimal.

5. Remove the hard drive and install it in the other drive bay. See "Hard Drives" on page 89.
6. If the problem is resolved, reinstall the hard drive in the original bay.

   If the hard drive functions properly in the original bay, the drive carrier could have intermittent problems. Replace the drive carrier.

7. If the hard drive is the boot drive, ensure that the drive is configured and connected properly. See "Configuring the Boot Drive" on page 91.
8. Partition and logically format the hard drive.
9. If possible, restore the files to the drive.

   If the problem persists, see "Getting Help" on page 127.

Troubleshooting Microprocessors

Problem

- System message indicates a problem with the microprocessor
- Heat sink is not installed for the microprocessor

Action

CAUTION: Many repairs may only be done by a certified service technician. You should only perform troubleshooting and simple repairs as authorized in your product documentation, or as directed by the online or telephone service and support team. Damage due to servicing that is not authorized by Dell is not covered by your warranty. Read and follow the safety instructions that came with the product.

1. Remove the server module. See "Removing a Server Module" on page 73.
2. Open the server module. See "Opening the Server Module" on page 75.
3. Ensure that the microprocessor(s) and heat sink(s) are properly installed. See "Processors" on page 84.

   If your system only has one microprocessor installed, ensure that it is installed in socket PROC_1. See Figure 6-3.
4. Close the server module. See "Closing the Server Module" on page 76.
5. Install the server module. See "Installing a Server Module" on page 74.
6. Run **Quick Tests** in the system diagnostics. See "Running System Diagnostics" on page 117.

   If the tests fail or the problem persists, see "Getting Help" on page 127.

Troubleshooting the Server Module Board

Problem

- System message indicates a problem with the server module board

Action

CAUTION: Only trained service technicians are authorized to remove the system cover and access any of the components inside the system. See your *Product Information Guide* for complete information about safety precautions, working inside the computer, and protecting against electrostatic discharge.

1. Turn off the server module.
2. Remove and reinstall the server module. See "Server Modules" on page 73.
3. Turn on the server module.
4. Run the system board test in the system diagnostics. See "Running System Diagnostics" on page 117.

   If the tests fail, see "Getting Help" on page 127.

Troubleshooting the Server Module Battery

Problem

- System message indicates a problem with the battery
- System Setup program loses system configuration information
- System date and time do not stay current

Each server module contains a battery, which maintains the server module configuration, date, and time information in NVRAM when you turn off the server module. You may need to replace the battery if an incorrect time or date is displayed during the boot routine.

You can operate the server module without a battery; however, the server module configuration information maintained by the battery in NVRAM is erased each time you remove power from the server module. Therefore, you must re-enter the system configuration information and reset the options each time the server module boots until you replace the battery.

Action

CAUTION: Many repairs may only be done by a certified service technician. You should only perform troubleshooting and simple repairs as authorized in your product documentation, or as directed by the online or telephone service and support team. Damage due to servicing that is not authorized by Dell is not covered by your warranty. Read and follow the safety instructions that came with the product.

1. Re-enter the time and date through the System Setup program. See "Using the System Setup Program" on page 43.
2. Remove the server module for at least one hour. See "Removing a Server Module" on page 73.
3. Install the server module. See "Installing a Server Module" on page 74.
4. Enter the System Setup program.

   If the date and time are not correct in the System Setup program, replace the battery. See "Server Module Battery" on page 88.

   If the problem is not resolved by replacing the battery, see "Getting Help" on page 127.

NOTICE: If the server module is turned off for long periods of time (for weeks or months), the NVRAM may lose its system configuration information. This situation is caused by a defective battery.

NOTE: Some software may cause the server module's time to speed up or slow down. If the server module seems to operate normally except for the time kept in the System Setup program, the problem may be caused by software rather than by a defective battery.

5

Running System Diagnostics

If you experience a problem with your server module, run the diagnostics before calling for technical assistance. The purpose of the diagnostics is to test your server module's hardware without requiring additional equipment or risking data loss. If you are unable to fix the problem yourself, service and support personnel can use diagnostics test results to help you solve the problem.

Using Server Administrator Diagnostics

To assess a server module problem, first use the online Server Administrator diagnostics. If you are unable to identify the problem, then use the system diagnostics.

To access the online diagnostics, log into the Server Administrator home page, and then click the **Diagnostics** tab. For information about using diagnostics, see the online help. For additional information, see the *Server Administrator User's Guide*.

System Diagnostics Features

The system diagnostics provides a series of menus and options for particular device groups or devices on a server module. The system diagnostics menus and options allow you to:

- Run tests individually or collectively
- Control the sequence of tests
- Repeat tests
- Display, print, or save test results
- Temporarily suspend testing if an error is detected or terminate testing when a user-defined error limit is reached
- View help messages that briefly describe each test and its parameters
- View status messages that inform you if tests are completed successfully
- View error messages that inform you of problems encountered during testing

When to Use the System Diagnostics

If a major component or device in the server module does not operate properly, component failure may be indicated. As long as the microprocessor and the server module's input/output devices (monitor, keyboard, and diskette drive) are functioning, you can use the system diagnostics to help identify the problem.

Running the System Diagnostics

The system diagnostics can be run from either the utility partition on your hard drive or a USB flash drive.

NOTICE: Use the system diagnostics to test only your server module. Using this program with other server modules may cause invalid results or error messages. In addition, use only the program that came with your server module (or an updated version of that program).

From the Utility Partition

1. As the server module boots, press <F10> during POST.
2. From the utility partition main menu under **Run System Utilities**, select **Run System Diagnostics**.

From a USB Flash Drive

NOTE: USB devices can be connected to a server module only through the front-panel custom cable.

1. Format the USB flash drive to emulate a hard drive.

   See the documentation that came with your USB flash drive for instructions.

2. Configure the USB flash drive to be a bootable device.

   See the documentation that came with your USB flash drive for instructions. Dell also provides a USB memory key boot utility for download at **support.dell.com**.

3. Install DKMS DOS on the USB flash drive.
4. Create a directory for the system diagnostics on the USB flash drive.
5. Copy the system diagnostics files into the directory.
6. Ensure that you have the USB flash drive connected to the server module.
7. Enter the System Setup program and ensure that the **USB Flash Drive Emulation Type** option is set to **Auto** and set the USB flash drive as the first device in the **Hard-Disk Drive Sequence** option.

   See "Using the System Setup Program" on page 43 for instructions.

   NOTE: If you power up or reboot the server module without the USB flash drive connected to the server module, you must reset the options in the System Setup program again.

8. Ensure that you have the USB flash drive connected to the server module.
9. Reboot the server module.

   If the server module fails to boot, see "Getting Help" on page 127.

When you start the system diagnostics, a message is displayed stating that the diagnostics are initializing. Next, the **Diagnostics** menu appears. The menu allows you to run all or specific diagnostics tests or to exit the system diagnostics.

NOTE: Before you read the rest of this section, start the system diagnostics so that you can see the utility on your screen.

System Diagnostics Testing Options

To select an option from the **Diagnostics** menu, highlight the option and press <Enter>, or press the key that corresponds to the highlighted letter in the option.

Table 5-1 provides a brief explanation of testing options.

Table 5-1. System Diagnostics Testing Options

Testing Option	Function
Quick Tests	Performs a quick check of the server module. Select **Test All Devices** and then select **Quick Tests**. This option runs device tests that do not require user interaction. Use this option to quickly identify the source of your problem.
Test One Device	Tests a particular device.
Extended Tests	Performs a more thorough check of the server module. Select **Test All Devices** and then select **Extended Tests**.
Advanced Testing	Checks a particular area of the server module.
Information and Results	Displays test results.
Program Options	Sets various test parameters.
Device Configuration	Displays an overview of the devices in the server module.
Exit to MS-DOS	Exits the diagnostics and returns to the **System Utilities** menu.

Using the Advanced Testing Options

When you select **Advanced Testing** from the **Diagnostics** menu, the main screen of the diagnostics appears and displays the following information:

- Two lines at the top of the screen identify the diagnostics utility, the version number, and the system's service tag number.
- The left side of the screen under **Device Groups** lists the diagnostic device groups in the order that they are tested if you select **All** under the **Run Tests** submenu. Press the up- or down-arrow keys to highlight a particular device group. Press the left- or right-arrow keys to select the options on the menu. As you move from one menu option to another, a brief explanation of the highlighted option appears at the bottom of the screen.

- The right side of the screen under **Devices for Highlighted Group** lists the specific devices within a particular test group.
- The menu area consists of two lines at the bottom of the screen. The first line lists the menu options that you can select; press the left- or right-arrow key to highlight an option. The second line provides information about the highlighted option.

For more information about a device group or device, highlight the Help option and press <Enter>. Press <Esc> to return to the previous screen.

Error Messages

When you run a system diagnostics test, you may receive an error message during testing. Record the message on a copy of the Diagnostics Checklist. For a copy of the Diagnostics Checklist and instructions for obtaining technical assistance, see "Getting Help" on page 127.

6

DIP Switch Settings and Connectors

This section provides detailed information about the sever-module board DIP switch settings. It also provides some basic information on switches and describes the connectors on the various boards in the system.

DIP Switch Settings—A General Explanation

DIP switches provide a convenient and reversible way of reconfiguring the circuitry on a printed circuit board. When reconfiguring the system, you may need to change DIP switch settings on circuit boards or drives.

DIP Switches

DIP switches are small blocks on a circuit board with one or more slide switches emerging from them. Each slide switch on the DIP switch is designated by a number. To change a DIP switch setting, move the appropriate slide switch to either the "on" or "off" position. Figure 6-1 shows an example of a DIP switch.

Figure 6-1. Example DIP Switch

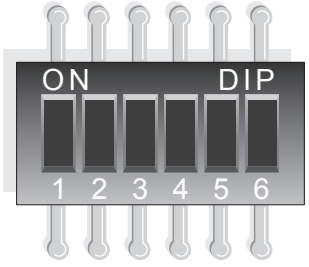


Figure 6-2 shows the location and default settings of the sever-module board DIP switch. See Table 6-1 for information about the DIP switch designations, default settings, and functions.

Server Module Board DIP Switch

CAUTION: Many repairs may only be done by a certified service technician. You should only perform troubleshooting and simple repairs as authorized in your product documentation, or as directed by the online or telephone service and support team. Damage due to servicing that is not authorized by Dell is not covered by your warranty. Read and follow the safety instructions that came with the product.

Figure 6-2 shows the location of the server-module board DIP switch on the server module board. Table 6-1 lists the switch settings.

NOTE: Figure 6-2 is oriented as viewed from the front of the server module.

Figure 6-2. Server Module Board DIP Switch

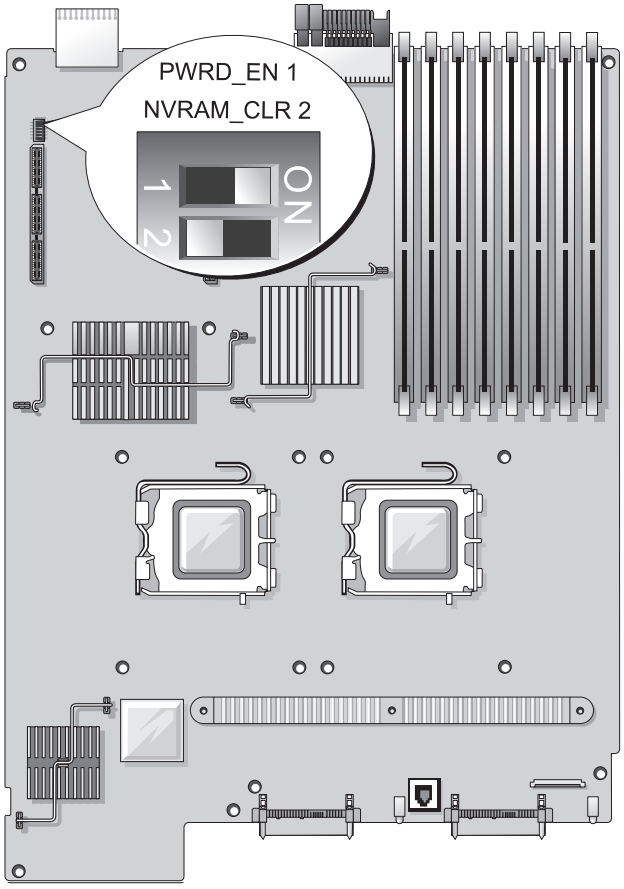


Table 6-1. Server-Module DIP Switch Settings

DIP Switch	Setting	Description
PWRD_EN (Switch 1)	(default)	The password feature is enabled when switch 1 is set to "on."
		The password feature is disabled when switch 1 is set to "off."
NVRAM_CLR (Switch 2)	(default)	The configuration settings in NVRAM are retained at system boot when switch 2 is set to "off."
		The configuration settings in NVRAM are cleared at next system boot when switch 2 is set to "on."

"on" "off"

Server Module Board Connectors

See Figure 6-3 and Table 6-1 for the location and description of the server module board connectors.

Figure 6-3. Server Module Board Connectors

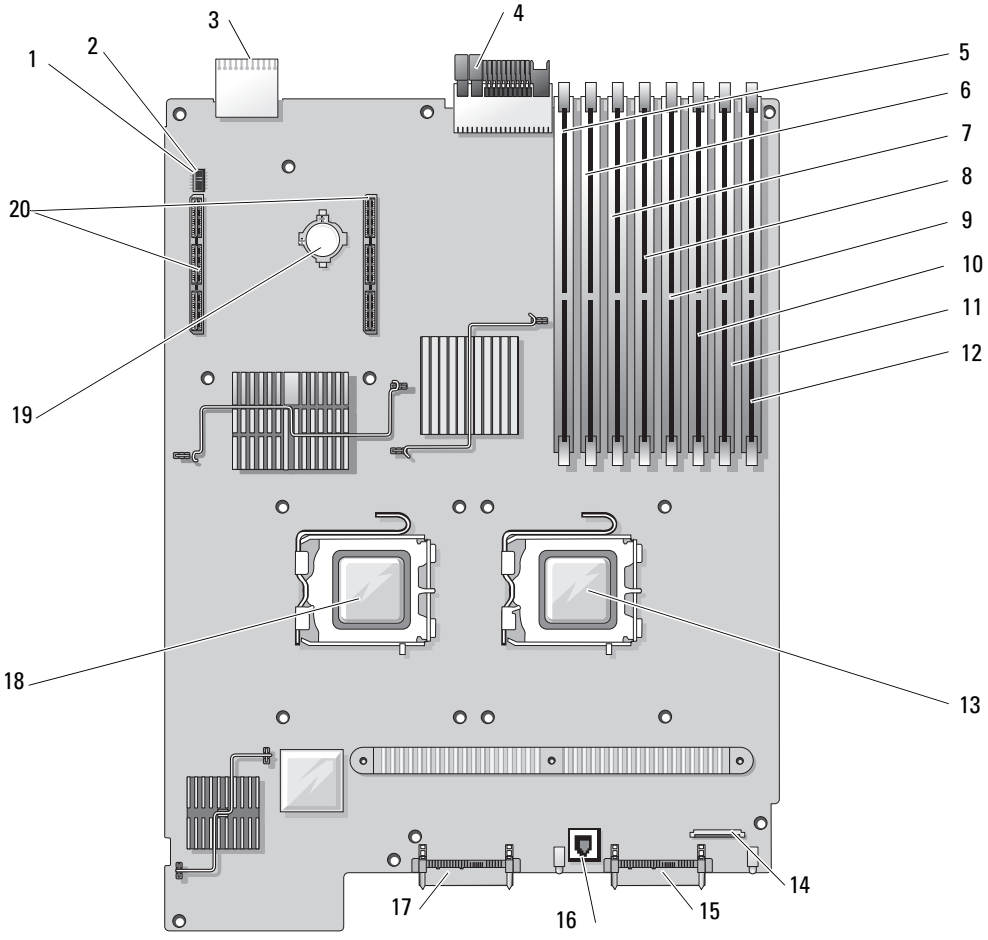


Table 6-2. System Board Connectors

	Connector	Description
1	PASSWD (switch 1)	password switch 1
2	NVRAM_CLR (switch 2)	clear NVRAM switch 2
3	CON2	Midplane connectors 2
4	CON1	Midplane connectors 1
5	DIMM 1	Memory module connector, slot 1
6	DIMM 5	Memory module connector, slot 5
7	DIMM 2	Memory module connector, slot 2
8	DIMM 6	Memory module connector, slot 6
9	DIMM 3	Memory module connector, slot 3
10	DIMM 7	Memory module connector, slot 7
11	DIMM 4	Memory module connector, slot 4
12	DIMM 8	Memory module connector, slot 8
13	CPU1	Processor 1 connector
14	CTRL_PNL	Front control panel cable connector
15	SAS_0	Hard drive 0 connector
16	TOE_KEY	Hardware key socket for enabling the integrated NIC TOE feature
17	SAS_1	Hard drive 1 connector
18	CPU2	Processor 2 connector
19	BATTERY	Connector for the 3.0-V coin battery
20	J7039, J7040	Daughter card connectors

NOTE: For the full name of an abbreviation or acronym used in this table, see the "Glossary" on page 149.

Disabling a Forgotten Password

The server module's software security features include a system password and a setup password, which are discussed in detail in "Using the System Setup Program" on page 43. The password jumper enables these password features or disables them and clears any password(s) currently in use.

CAUTION: Many repairs may only be done by a certified service technician. You should only perform troubleshooting and simple repairs as authorized in your product documentation, or as directed by the online or telephone service and support team. Damage due to servicing that is not authorized by Dell is not covered by your warranty. Read and follow the safety instructions that came with the product.

1. Remove the server module. See "Removing a Server Module" on page 73.
2. Open the server module. See "Opening the Server Module" on page 75.
3. If a daughter card is installed on the server module board, remove the daughter card. See "Removing a Daughter Card" on page 83.
4. Use a small plastic scribe to move the password switch 1 to the "off" position.

   See Figure 6-3 to locate the password switch 1 on the server module board.
5. If you removed a daughter card from the server module board, reinstall it. See "Installing a Daughter Card" on page 82.
6. Close the server module. See "Closing the Server Module" on page 76.
7. Install the server module. See "Installing a Server Module" on page 74.

   When the server module is on, the power-on indicator is solid green. Allow the server module to finish booting.

   The existing passwords are not disabled (erased) until the system boots with the password switch 1 to the "off" position. However, before you assign a new system and/or setup password, you must move the password switch 1 to the "on" position.

   NOTE: If you assign a new system and/or setup password with the switch 1 still in to the "off" position, the system disables the new password(s) the next time it boots.
8. Remove the server module. See "Removing a Server Module" on page 73.
9. Open the server module. See "Opening the Server Module" on page 75.
10. If a daughter card is installed on the server module board, remove the daughter card. See "Removing a Daughter Card" on page 83.
11. Use a small plastic scribe to return the password switch 1 to the "on" position.
12. If you removed a daughter card from the server module board, reinstall it. See "Installing a Daughter Card" on page 82.
13. Close the server module. See "Closing the Server Module" on page 76.
14. Install the server module. See "Installing a Server Module" on page 74.
15. Assign a new system and/or setup password. See "System and Setup Password Features" on page 51.

7

Getting Help

Technical Assistance

If you need assistance with a technical problem, perform the following steps:

1. Complete the procedures in "Troubleshooting Your System" on page 101.
2. Run the system diagnostics and record any information provided.
3. Make a copy of the Diagnostics Checklist, and fill it out.
4. Use Dell's extensive suite of online services available at Dell Support at **support.dell.com** for help with installation and troubleshooting procedures.

   For more information, see "Online Services" on page 127.
5. If the preceding steps have not resolved the problem, call Dell for technical assistance.

NOTE: Call technical support from a phone near or at the system so that technical support can assist you with any necessary procedures.

NOTE: Dell's Express Service Code system may not be available in all countries.

When prompted by Dell's automated telephone system, enter your Express Service Code to route the call directly to the proper support personnel. If you do not have an Express Service Code, open the **Dell Accessories** folder, double-click the **Express Service Code** icon, and follow the directions.

For instructions on using the technical support service, see "Technical Support Service" on page 128 and "Before You Call" on page 129.

NOTE: Some of the following services are not always available in all locations outside the continental U.S. Call your local Dell representative for information on availability.

Online Services

You can access Dell Support at **support.dell.com**. Select your region on the **WELCOME TO DELL SUPPORT** page, and fill in the requested details to access help tools and information.

You can contact Dell electronically using the following addresses:

- World Wide Web

  www.dell.com/

  www.dell.com/ap/ (Asian/Pacific countries only)

  www.dell.com/jp (Japan only)

www.euro.dell.com (Europe only)

www.dell.com/la (Latin American countries)

www.dell.ca (Canada only)

- Anonymous file transfer protocol (FTP)

  ftp.dell.com/

  Log in as `user:anonymous`, and use your e-mail address as your password.

- Electronic Support Service

  support@us.dell.com

  apsupport@dell.com (Asian/Pacific countries only)

  support.jp.dell.com (Japan only)

  support.euro.dell.com (Europe only)

- Electronic Quote Service

  apmarketing@dell.com (Asian/Pacific countries only)

  sales_canada@dell.com (Canada only)

AutoTech Service

Dell's automated technical support service—AutoTech—provides recorded answers to the questions most frequently asked by Dell customers about their portable and desktop computer systems.

When you call AutoTech, use your touch-tone telephone to select the subjects that correspond to your questions.

The AutoTech service is available 24 hours a day, 7 days a week. You can also access this service through the technical support service. See the contact information for your region.

Automated Order-Status Service

To check on the status of any Dell™ products that you have ordered, you can go to **support.dell.com**, or you can call the automated order-status service. A recording prompts you for the information needed to locate and report on your order. See the contact information for your region.

Technical Support Service

Dell's technical support service is available 24 hours a day, 7 days a week, to answer your questions about Dell hardware. Our technical support staff use computer-based diagnostics to provide fast, accurate answers.

To contact Dell's technical support service, see "Before You Call" on page 129 and then see the contact information for your region.

Dell Enterprise Training and Certification

Dell Enterprise Training and Certification is available; see **www.dell.com/training** for more information. This service may not be offered in all locations.

Problems With Your Order

If you have a problem with your order, such as missing parts, wrong parts, or incorrect billing, contact Dell for customer assistance. Have your invoice or packing slip available when you call. See the contact information for your region.

Product Information

If you need information about additional products available from Dell, or if you would like to place an order, visit the Dell website at **www.dell.com**. For the telephone number to call to speak to a sales specialist, see the contact information for your region.

Returning Items for Warranty Repair or Credit

Prepare all items being returned, whether for repair or credit, as follows:

1. Call Dell to obtain a Return Material Authorization Number, and write it clearly and prominently on the outside of the box.

   For the telephone number to call, see the contact information for your region.

2. Include a copy of the invoice and a letter describing the reason for the return.
3. Include a copy of any diagnostic information (including the Diagnostics Checklist) indicating the tests you have run and any error messages reported by the system diagnostics.
4. Include any accessories that belong with the item(s) being returned (such as power cables, media such as CDs and diskettes, and guides) if the return is for credit.
5. Pack the equipment to be returned in the original (or equivalent) packing materials.

   You are responsible for paying shipping expenses. You are also responsible for insuring any product returned, and you assume the risk of loss during shipment to Dell. Collect-on-delivery (C.O.D.) packages are not accepted.

Returns that are missing any of the preceding requirements will be refused at our receiving dock and returned to you.

Before You Call

NOTE: Have your Express Service Code ready when you call. The code helps Dell's automated-support telephone system direct your call more efficiently.

Remember to fill out the Diagnostics Checklist. If possible, turn on your system before you call Dell for technical assistance and call from a telephone at or near the computer. You may be asked to type some commands at the keyboard, relay detailed information during operations, or try other troubleshooting steps possible only at the computer system itself. Ensure that the system documentation is available.

CAUTION: Before servicing any components inside your computer, see your *Product Information Guide* for important safety information.

Diagnostics Checklist

Name:

Date:

Address:

Phone number:

Service Tag (bar code on the back of the computer):

Express Service Code:

Return Material Authorization Number (if provided by Dell support technician):

Operating system and version:

Peripherals:

Expansion cards:

Are you connected to a network? Yes No

Network, version, and network card:

Programs and versions:

See your operating system documentation to determine the contents of the system's start-up files. If possible, print each file. Otherwise, record the contents of each file before calling Dell.

Error message or diagnostic code:

Description of problem and troubleshooting procedures you performed:

Contacting Dell

To contact Dell electronically, you can access the following websites:

- **www.dell.com**
- **support.dell.com** (technical support)
- **premiersupport.dell.com** (technical support for educational, government, healthcare, and medium/large business customers, including Premier, Platinum, and Gold customers)

For specific web addresses for your country, find the appropriate country section in the table below.

NOTE: Toll-free numbers are for use within the country for which they are listed.

NOTE: In certain countries, technical support specific to Dell XPS portable computers is available at a separate telephone number listed for participating countries. If you do not see a telephone number listed that is specific for XPS portable computers, you may contact Dell through the technical support number listed and your call will be routed appropriately.

When you need to contact Dell, use the electronic addresses, telephone numbers, and codes provided in the following table. If you need assistance in determining which codes to use, contact a local or an international operator.

Country (City) International Access Code Country Code City Code	Department Name or Service Area, Website and E-Mail Address	Area Codes, Local Numbers, and Toll-Free Numbers
Anguilla	General Support	toll-free: 800-335-0031
Antigua and Barbuda	General Support	1-800-805-5924
Argentina (Buenos Aires)	Website: **www.dell.com.ar**	
International Access Code: **00**	E-mail: us_latin_services@dell.com	
Country Code: **54**	E-mail for desktop and portable computers: la-techsupport@dell.com	
City Code: **11**	E-mail for servers and EMC® storage products: la_enterprise@dell.com	
	Customer Care	toll-free: 0-800-444-0730
	Technical Support	toll-free: 0-800-444-0733
	Technical Support Services	toll-free: 0-800-444-0724
	Sales	0-810-444-3355
Aruba	General Support	toll-free: 800-1578

Country (City) International Access Code Country Code City Code	Department Name or Service Area, Website and E-Mail Address	Area Codes, Local Numbers, and Toll-Free Numbers
Australia (Sydney)	Website: support.ap.dell.com	
International Access Code: **0011**	E-mail: support.ap.dell.com/contactus	
Country Code: **61**	General Support	13DELL-133355
City Code: **2**		
Austria (Vienna)	Website: **support.euro.dell.com**	
International Access Code: **900**	E-mail: tech_support_central_europe@dell.com	
Country Code: **43**	Home/Small Business Sales	0820 240 530 00
City Code: **1**	Home/Small Business Fax	0820 240 530 49
	Home/Small Business Customer Care	0820 240 530 14
	Preferred Accounts/Corporate Customer Care	0820 240 530 16
	Support for XPS portable computers only	0820 240 530 81
	Home/Small Business Support for all other Dell computers	0820 240 530 14
	Preferred Accounts/Corporate Support	0660 8779
	Switchboard	0820 240 530 00
Bahamas	General Support	toll-free: 1-866-278-6818
Barbados	General Support	1-800-534-3066
Belgium (Brussels)	Website: **support.euro.dell.com**	
International Access Code: **00**	Tech Support for XPS portable computers only	02 481 92 96
Country Code: **32**	Tech Support for all other Dell computers	02 481 92 88
City Code: **2**	Tech Support Fax	02 481 92 95
	Customer Care	02 713 15 65
	Corporate Sales	02 481 91 00
	Fax	02 481 92 99
	Switchboard	02 481 91 00
Bermuda	General Support	1-800-342-0671
Bolivia	General Support	toll-free: 800-10-0238

Country (City) International Access Code Country Code City Code	Department Name or Service Area, Website and E-Mail Address	Area Codes, Local Numbers, and Toll-Free Numbers
Brazil	Website: **www.dell.com/br**	
International Access Code: **00**	Customer Support, Tech Support	
Country Code: **55**		0800 90 3355
City Code: **51**	Technical Support Fax	51 481 5470
	Customer Care Fax	51 481 5480
	Sales	0800 90 3390
British Virgin Islands	General Support	toll-free: 1-866-278-6820
Brunei	Technical Support (Penang, Malaysia)	604 633 4966
Country Code: **673**	Customer Care (Penang, Malaysia)	604 633 4888
	Transaction Sales (Penang, Malaysia)	604 633 4955
Canada (North York, Ontario)	Online Order Status: **www.dell.ca/ostatus**	
International Access Code: **011**	AutoTech (automated Hardware and Warranty Support)	toll-free: 1-800-247-9362
	Customer Service (Home Sales/Small Business)	toll-free: 1-800-847-4096
	Customer Service (med./large business, government)	toll-free: 1-800-326-9463
	Customer Service (printers, projectors, televisions, handhelds, digital jukebox, and wireless)	toll-free: 1-800-847-4096
	Hardware Warranty Support (Home Sales/Small Business)	toll-free: 1-800-906-3355
	Hardware Warranty Support (med./large bus., government)	toll-free: 1-800-387-5757
	Hardware Warranty Support (printers, projectors, televisions, handhelds, digital jukebox, and wireless)	1-877-335-5767
	Sales (Home Sales/Small Business)	toll-free: 1-800-387-5752
	Sales (med./large bus., government)	toll-free: 1-800-387-5755
	Spare Parts Sales & Extended Service Sales	1 866 440 3355
Cayman Islands	General Support	1-800-805-7541
Chile (Santiago)	Sales and Customer Support	toll-free: 1230-020-4823
Country Code: **56**		
City Code: **2**		

Country (City) International Access Code Country Code City Code	Department Name or Service Area, Website and E-Mail Address	Area Codes, Local Numbers, and Toll-Free Numbers
China (Xiamen)	Technical Support website: **support.dell.com.cn**	
Country Code: **86**	Technical Support E-mail: cn_support@dell.com	
City Code: **592**	Customer Care E-mail: customer_cn@dell.com	
	Technical Support Fax	592 818 1350
	Technical Support (Dell™ Dimension™ and Inspiron)	toll-free: 800 858 2968
	Technical Support (OptiPlex™, Latitude™, and Dell Precision™)	toll-free: 800 858 0950
	Technical Support (servers and storage)	toll-free: 800 858 0960
	Technical Support (projectors, PDAs, switches, routers, and so on)	toll-free: 800 858 2920
	Technical Support (printers)	toll-free: 800 858 2311
	Customer Care	toll-free: 800 858 2060
	Customer Care Fax	592 818 1308
	Home and Small Business	toll-free: 800 858 2222
	Preferred Accounts Division	toll-free: 800 858 2557
	Large Corporate Accounts GCP	toll-free: 800 858 2055
	Large Corporate Accounts Key Accounts	toll-free: 800 858 2628
	Large Corporate Accounts North	toll-free: 800 858 2999
	Large Corporate Accounts North Government and Education	toll-free: 800 858 2955
	Large Corporate Accounts East	toll-free: 800 858 2020
	Large Corporate Accounts East Government and Education	toll-free: 800 858 2669
	Large Corporate Accounts Queue Team	toll-free: 800 858 2572
	Large Corporate Accounts South	toll-free: 800 858 2355
	Large Corporate Accounts West	toll-free: 800 858 2811
	Large Corporate Accounts Spare Parts	toll-free: 800 858 2621
Colombia	General Support	980-9-15-3978
Costa Rica	General Support	0800-012-0435

Country (City) International Access Code Country Code City Code	Department Name or Service Area, Website and E-Mail Address	Area Codes, Local Numbers, and Toll-Free Numbers
Czech Republic (Prague)	Website: **support.euro.dell.com**	
International Access Code: **00**	E-mail: czech_dell@dell.com	
Country Code: **420**	Technical Support	22537 2727
	Customer Care	22537 2707
	Fax	22537 2714
	Technical Fax	22537 2728
	Switchboard	22537 2711
Denmark (Copenhagen)	Website: **support.euro.dell.com**	
International Access Code: **00**	Technical Support for XPS portable computers only	7010 0074
Country Code: **45**	Technical Support for all other Dell computers	7023 0182
	Customer Care (Relational)	7023 0184
	Home/Small Business Customer Care	3287 5505
	Switchboard (Relational)	3287 1200
	Switchboard Fax (Relational)	3287 1201
	Switchboard (Home/Small Business)	3287 5000
	Switchboard Fax (Home/Small Business)	3287 5001
Dominica	General Support	toll-free: 1-866-278-6821
Dominican Republic	General Support	1-800-148-0530
Ecuador	General Support	toll-free: 999-119
El Salvador	General Support	01-899-753-0777
Finland (Helsinki)	Website: **support.euro.dell.com**	
International Access Code: **990**	Technical Support	09 253 313 60
Country Code: **358**	Customer Care	09 253 313 38
City Code: **9**	Fax	09 253 313 99
	Switchboard	09 253 313 00

Country (City) International Access Code Country Code City Code	Department Name or Service Area, Website and E-Mail Address	Area Codes, Local Numbers, and Toll-Free Numbers
France (Paris) (Montpellier)	Website: **support.euro.dell.com**	
International Access Code: **00**	**Home and Small Business**	
Country Code: **33**	Technical Support for XPS portable computers only	0825 387 129
City Codes: **(1) (4)**	Technical Support for all other Dell computers	0825 387 270
	Customer Care	0825 823 833
	Switchboard	0825 004 700
	Switchboard (calls from outside of France)	04 99 75 40 00
	Sales	0825 004 700
	Fax	0825 004 701
	Fax (calls from outside of France)	04 99 75 40 01
	Corporate	
	Technical Support	0825 004 719
	Customer Care	0825 338 339
	Switchboard	01 55 94 71 00
	Sales	01 55 94 71 00
	Fax	01 55 94 71 01
Germany (Langen)	Website: **support.euro.dell.com**	
International Access Code: **00**	E-mail: tech_support_central_europe@dell.com	
Country Code: **49**	Technical Support for XPS portable computers only	06103 766-7222
City Code: **6103**	Technical Support for all other Dell computers	06103 766-7200
	Home/Small Business Customer Care	0180-5-224400
	Global Segment Customer Care	06103 766-9570
	Preferred Accounts Customer Care	06103 766-9420
	Large Accounts Customer Care	06103 766-9560
	Public Accounts Customer Care	06103 766-9555
	Switchboard	06103 766-7000

Country (City) International Access Code Country Code City Code	Department Name or Service Area, Website and E-Mail Address	Area Codes, Local Numbers, and Toll-Free Numbers
Greece	Website: **support.euro.dell.com**	
International Access Code: **00**	Technical Support	00800-44 14 95 18
Country Code: **30**	Gold Service Technical Support	00800-44 14 00 83
	Switchboard	2108129810
	Gold Service Switchboard	2108129811
	Sales	2108129800
	Fax	2108129812
Grenada	General Support	toll-free: 1-866-540-3355
Guatemala	General Support	1-800-999-0136
Guyana	General Support	toll-free: 1-877-270-4609
Hong Kong	Website: support.ap.dell.com	
International Access Code: **001**	Technical Support E-mail: HK_support@Dell.com	
Country Code: **852**	Technical Support (Dimension and Inspiron)	2969 3188
	Technical Support (OptiPlex, Latitude, and Dell Precision)	2969 3191
	Technical Support (PowerApp™, PowerEdge™, PowerConnect™, and PowerVault™)	2969 3196
	Customer Care	3416 0910
	Large Corporate Accounts	3416 0907
	Global Customer Programs	3416 0908
	Medium Business Division	3416 0912
	Home and Small Business Division	2969 3105
India	E-mail: india_support_desktop@dell.com india_support_notebook@dell.com india_support_Server@dell.com	
	Technical Support	1600338045
		and 1600448046
	Sales (Large Corporate Accounts)	1600 33 8044
	Sales (Home and Small Business)	1600 33 8046

Country (City) International Access Code Country Code City Code	Department Name or Service Area, Website and E-Mail Address	Area Codes, Local Numbers, and Toll-Free Numbers
Ireland (Cherrywood)	Website: **support.euro.dell.com**	
International Access Code: **00**	E-mail: dell_direct_support@dell.com	
Country Code: **353**	Technical Support for XPS portable computers only	1850 200 722
City Code: **1**	Technical Support for all other Dell computers	1850 543 543
	U.K. Technical Support (dial within U.K. only)	0870 908 0800
	Home User Customer Care	01 204 4014
	Small Business Customer Care	01 204 4014
	U.K. Customer Care (dial within U.K. only)	0870 906 0010
	Corporate Customer Care	1850 200 982
	Corporate Customer Care (dial within U.K. only)	0870 907 4499
	Ireland Sales	01 204 4444
	U.K. Sales (dial within U.K. only)	0870 907 4000
	Fax/Sales Fax	01 204 0103
	Switchboard	01 204 4444
Italy (Milan)	Website: **support.euro.dell.com**	
International Access Code: **00**	**Home and Small Business**	
Country Code: **39**	Technical Support	02 577 826 90
City Code: **02**	Customer Care	02 696 821 14
	Fax	02 696 821 13
	Switchboard	02 696 821 12
	Corporate	
	Technical Support	02 577 826 90
	Customer Care	02 577 825 55
	Fax	02 575 035 30
	Switchboard	02 577 821
Jamaica	General Support (dial from within Jamaica only)	1-800-682-3639

Country (City) International Access Code Country Code City Code	Department Name or Service Area, Website and E-Mail Address	Area Codes, Local Numbers, and Toll-Free Numbers
Japan (Kawasaki)	Website: **support.jp.dell.com**	
International Access Code: **001**	Technical Support (servers)	toll-free: 0120-198-498
Country Code: **81**	Technical Support outside of Japan (servers)	81-44-556-4162
City Code: **44**	Technical Support (Dimension and Inspiron)	toll-free: 0120-198-226
	Technical Support outside of Japan (Dimension and Inspiron)	81-44-520-1435
	Technical Support (Dell Precision, OptiPlex, and Latitude)	toll-free:0120-198-433
	Technical Support outside of Japan (Dell Precision, OptiPlex, and Latitude)	81-44-556-3894
	Technical Support (PDAs, projectors, printers, routers)	toll-free: 0120-981-690
	Technical Support outside of Japan (PDAs, projectors, printers, routers)	81-44-556-3468
	Faxbox Service	044-556-3490
	24-Hour Automated Order Service	044-556-3801
	Customer Care	044-556-4240
	Business Sales Division (up to 400 employees)	044-556-1465
	Preferred Accounts Division Sales (over 400 employees)	044-556-3433
	Large Corporate Accounts Sales (over 3500 employees)	044-556-3430
	Public Sales (government agencies, educational institutions, and medical institutions)	044-556-1469
	Global Segment Japan	044-556-3469
	Individual User	044-556-1760
	Switchboard	044-556-4300
Korea (Seoul)	E-mail: krsupport@dell.com	
International Access Code: **001**	Support	toll-free: 080-200-3800
Country Code: **82** City Code: **2**	Support (Dimension, PDA, Electronics and Accessories)	toll-free: 080-200-3801
	Sales	toll-free: 080-200-3600
	Fax	2194-6202
	Switchboard	2194-6000

Country (City) International Access Code Country Code City Code	Department Name or Service Area, Website and E-Mail Address	Area Codes, Local Numbers, and Toll-Free Numbers
Latin America	Customer Technical Support (Austin, Texas, U.S.A.)	512 728-4093
	Customer Service (Austin, Texas, U.S.A.)	512 728-3619
	Fax (Technical Support and Customer Service) (Austin, Texas, U.S.A.)	512 728-3883
	Sales (Austin, Texas, U.S.A.)	512 728-4397
	SalesFax (Austin, Texas, U.S.A.)	512 728-4600 or 512 728-3772
Luxembourg	Website: **support.euro.dell.com**	
International Access Code: **00**	Support	342 08 08 075
Country Code: **352**	Home/Small Business Sales	+32 (0)2 713 15 96
	Corporate Sales	26 25 77 81
	Customer Care	+32 (0)2 481 91 19
	Fax	26 25 77 82
Macao	Technical Support	toll-free: 0800 105
Country Code: **853**	Customer Service (Xiamen, China)	34 160 910
	Transaction Sales (Xiamen, China)	29 693 115
Malaysia (Penang)	Website: **support.ap.dell.com**	
International Access Code: **00**	Technical Support (Dell Precision, OptiPlex, and Latitude)	toll-free: 1 800 880 193
Country Code: **60**		
City Code: **4**	Technical Support (Dimension, Inspiron, and Electronics and Accessories)	toll-free: 1 800 881 306
	Technical Support (PowerApp, PowerEdge, PowerConnect, and PowerVault)	toll-free: 1800 881 386
	Customer Care	toll-free: 1800 881 306 (option 6)
	Transaction Sales	toll-free: 1 800 888 202
	Corporate Sales	toll-free: 1 800 888 213

Country (City) International Access Code Country Code City Code	Department Name or Service Area, Website and E-Mail Address	Area Codes, Local Numbers, and Toll-Free Numbers
Mexico	Customer Technical Support	001-877-384-8979
International Access Code: **00**		or 001-877-269-3383
Country Code: **52**	Sales	50-81-8800
		or 01-800-888-3355
	Customer Service	001-877-384-8979
		or 001-877-269-3383
	Main	50-81-8800
		or 01-800-888-3355
Montserrat	General Support	toll-free: 1-866-278-6822
Netherlands Antilles	General Support	001-800-882-1519
Netherlands (Amsterdam)	Website: **support.euro.dell.com**	
International Access Code: **00**	Technical Support for XPS portable computers only	020 674 45 94
Country Code: **31**	Technical Support for all other Dell computers	020 674 45 00
City Code: **20**	Technical Support Fax	020 674 47 66
	Home/Small Business Customer Care	020 674 42 00
	Relational Customer Care	020 674 4325
	Home/Small Business Sales	020 674 55 00
	Relational Sales	020 674 50 00
	Home/Small Business Sales Fax	020 674 47 75
	Relational Sales Fax	020 674 47 50
	Switchboard	020 674 50 00
	Switchboard Fax	020 674 47 50
New Zealand	Website: **support.ap.dell.com**	
International Access Code: **00**	E-mail: support.ap.dell.com/contactus	
Country Code: **64**	General Support	0800 441 567
Nicaragua	General Support	001-800-220-1006

Country (City) International Access Code Country Code City Code	Department Name or Service Area, Website and E-Mail Address	Area Codes, Local Numbers, and Toll-Free Numbers
Norway (Lysaker)	Website: **support.euro.dell.com**	
International Access Code: **00**	Technical Support for XPS portable computers only	815 35 043
Country Code: **47**	Technical Support for all other Dell products	671 16882
	Relational Customer Care	671 17575
	Home/Small Business Customer Care	23162298
	Switchboard	671 16800
	Fax Switchboard	671 16865
Panama	General Support	001-800-507-0962
Peru	General Support	0800-50-669
Poland (Warsaw)	Website: **support.euro.dell.com**	
International Access Code: **011**	E-mail: pl_support_tech@dell.com	
Country Code: **48**	Customer Service Phone	57 95 700
City Code: **22**	Customer Care	57 95 999
	Sales	57 95 999
	Customer Service Fax	57 95 806
	Reception Desk Fax	57 95 998
	Switchboard	57 95 999
Portugal	Website: **support.euro.dell.com**	
International Access Code: **00**	Technical Support	707200149
Country Code: **351**	Customer Care	800 300 413
	Sales	800 300 410 or 800 300 411 or 800 300 412 or 21 422 07 10
	Fax	21 424 01 12
Puerto Rico	General Support	1-800-805-7545
St. Kitts and Nevis	General Support	toll-free: 1-877-441-4731
St. Lucia	General Support	1-800-882-1521
St. Vincent and the Grenadines	General Support	toll-free: 1-877-270-4609

Country (City) International Access Code Country Code City Code	Department Name or Service Area, Website and E-Mail Address	Area Codes, Local Numbers, and Toll-Free Numbers
Singapore (Singapore)	Website: **support.ap.dell.com**	
International Access Code: **005** Country Code: **65**	Technical Support (Dimension, Inspiron, and Electronics and Accessories)	toll-free: 1800 394 7430
	Technical Support (OptiPlex, Latitude, and Dell Precision)	toll-free: 1800 394 7488
	Technical Support (PowerApp, PowerEdge, PowerConnect, and PowerVault)	toll-free: 1800 394 7478
	Customer Care	toll-free: 1 800 394 7430 (option 6)
	Transaction Sales	toll-free: 1 800 394 7412
	Corporate Sales	toll-free: 1 800 394 7419
Slovakia (Prague)	Website: **support.euro.dell.com**	
International Access Code: **00**	E-mail: czech_dell@dell.com	
Country Code: **421**	Technical Support	02 5441 5727
	Customer Care	420 22537 2707
	Fax	02 5441 8328
	Tech Fax	02 5441 8328
	Switchboard (Sales)	02 5441 7585
South Africa (Johannesburg)	Website: **support.euro.dell.com**	
International Access Code:	E-mail: dell_za_support@dell.com	
09/091	Gold Queue	011 709 7713
Country Code: **27**	Technical Support	011 709 7710
City Code: **11**	Customer Care	011 709 7707
	Sales	011 709 7700
	Fax	011 706 0495
	Switchboard	011 709 7700
Southeast Asian and Pacific Countries	Technical Support, Customer Service, and Sales (Penang, Malaysia)	604 633 4810

Country (City) International Access Code Country Code City Code	Department Name or Service Area, Website and E-Mail Address	Area Codes, Local Numbers, and Toll-Free Numbers
Spain (Madrid)	Website: **support.euro.dell.com**	
International Access Code: **00**	**Home and Small Business**	
Country Code: **34**	Technical Support	902 100 130
City Code: **91**	Customer Care	902 118 540
	Sales	902 118 541
	Switchboard	902 118 541
	Fax	902 118 539
	Corporate	
	Technical Support	902 100 130
	Customer Care	902 115 236
	Switchboard	91 722 92 00
	Fax	91 722 95 83
Sweden (Upplands Vasby)	Website: **support.euro.dell.com**	
International Access Code: **00**	Technical Support for XPS portable computers only	0771 340 340
Country Code: **46**	Technical Support for all other Dell products	08 590 05 199
City Code: 8	Relational Customer Care	08 590 05 642
	Home/Small Business Customer Care	08 587 70 527
	Employee Purchase Program (EPP) Support	20 140 14 44
	Technical Support Fax	08 590 05 594
	Sales	08 590 05 185
Switzerland (Geneva)	Website: **support.euro.dell.com**	
International Access Code: **00**	E-mail: Tech_support_central_Europe@dell.com	
Country Code: **41**	Technical Support for XPS portable computers only	0848 33 88 57
City Code: **22**	Technical Support (Home and Small Business) for all other Dell products	0844 811 411
	Technical Support (Corporate)	0844 822 844
	Customer Care (Home and Small Business)	0848 802 202
	Customer Care (Corporate)	0848 821 721
	Fax	022 799 01 90
	Switchboard	022 799 01 01

Country (City) International Access Code Country Code City Code	Department Name or Service Area, Website and E-Mail Address	Area Codes, Local Numbers, and Toll-Free Numbers
Taiwan	Website: **support.ap.dell.com**	
International Access Code: **002**	E-mail: ap_support@dell.com	
Country Code: **886**	Technical Support (OptiPlex, Latitude, Inspiron, Dimension, and Electronics and Accessories)	toll-free: 00801 86 1011
	Technical Support (PowerApp, PowerEdge, PowerConnect, and PowerVault)	toll-free: 00801 60 1256
	Customer Care	toll-free: 00801 60 1250 (option 5)
	Transaction Sales	toll-free: 00801 65 1228
	Corporate Sales	toll-free: 00801 651 227
Thailand	Website: **support.ap.dell.com**	
International Access Code: **001** Country Code: **66**	Technical Support (OptiPlex, Latitude, and Dell Precision)	toll-free: 1800 0060 07
	Technical Support (PowerApp, PowerEdge, PowerConnect, and PowerVault)	toll-free: 1800 0600 09
	Customer Care	toll-free: 1800 006 007 (option 7)
	Corporate Sales	toll-free: 1800 006 009
	Transaction Sales	toll-free: 1800 006 006
Trinidad/Tobago	General Support	1-800-805-8035
Turks and Caicos Islands	General Support	toll-free: 1-866-540-3355

Country (City) International Access Code Country Code City Code	Department Name or Service Area, Website and E-Mail Address	Area Codes, Local Numbers, and Toll-Free Numbers
U.K. (Bracknell)	Website: **support.euro.dell.com**	
International Access Code: **00**	Customer Care website: **support.euro.dell.com/uk/en/ECare/Form/Home.asp**	
Country Code: **44**	E-mail: dell_direct_support@dell.com	
City Code: **1344**	Technical Support (Corporate/Preferred Accounts/PAD [1000+ employees])	0870 908 0500
	Technical Support for XPS portable computers only	0870 366 4180
	Technical Support (direct and general) for all other products	0870 908 0800
	Global Accounts Customer Care	01344 373 186
	Home and Small Business Customer Care	0870 906 0010
	Corporate Customer Care	01344 373 185
	Preferred Accounts (500–5000 employees) Customer Care	0870 906 0010
	Central Government Customer Care	01344 373 193
	Local Government & Education Customer Care	01344 373 199
	Health Customer Care	01344 373 194
	Home and Small Business Sales	0870 907 4000
	Corporate/Public Sector Sales	01344 860 456
	Home and Small Business Fax	0870 907 4006
Uruguay	General Support	toll-free: 000-413-598-2521

Country (City) International Access Code Country Code City Code	Department Name or Service Area, Website and E-Mail Address	Area Codes, Local Numbers, and Toll-Free Numbers
U.S.A. (Austin, Texas)	Automated Order-Status Service	toll-free: 1-800-433-9014
International Access Code: **011**	AutoTech (portable and desktop computers)	toll-free: 1-800-247-9362
Country Code: **1**	Hardware and Warranty Support (Dell TV, Printers, and Projectors) for Relationship customers	toll-free 1-877-459-7298
	Consumer (Home and Home Office) Support for all other Dell products	toll-free: 1-800-624-9896
	Customer Service	toll-free: 1-800-624-9897
	Employee Purchase Program (EPP) Customers	toll-free: 1-800-695-8133
	Financial Services website: **www.dellfinancialservices.com**	
	Financial Services (lease/loans)	toll-free: 1-877-577-3355
	Financial Services (Dell Preferred Accounts [DPA])	toll-free: 1-800-283-2210
	Business	
	Customer Service and Support	toll-free: 1-800-456-3355
	Employee Purchase Program (EPP) Customers	toll-free: 1-800-695-8133
	Printers and Projectors Support	toll-free: 1-877-459-7298
	Public (government, education, and healthcare)	
	Customer Service and Support	toll-free: 1-800-456-3355
	Employee Purchase Program (EPP) Customers	toll-free: 1-800-695-8133
	Dell Sales	toll-free: 1-800-289-3355 or toll-free: 1-800-879-3355
	Dell Outlet Store (Dell refurbished computers)	toll-free: 1-888-798-7561
	Software and Peripherals Sales	toll-free: 1-800-671-3355
	Spare Parts Sales	toll-free: 1-800-357-3355
	Extended Service and Warranty Sales	toll-free: 1-800-247-4618
	Fax	toll-free: 1-800-727-8320
	Dell Services for the Deaf, Hard-of-Hearing, or Speech-Impaired	toll-free: 1-877-DELLTTY (1-877-335-5889)
U.S. Virgin Islands	General Support	1-877-673-3355
Venezuela	General Support	8001-3605

Glossary

This section defines or identifies technical terms, abbreviations, and acronyms used in your system documents.

A — Ampere(s).

AC — Alternating current.

ACPI — Advanced Configuration and Power Interface. A standard interface for enabling the operating system to direct configuration and power management.

ambient temperature — The temperature of the area or room where the system is located.

ANSI — American National Standards Institute. The primary organization for developing technology standards in the U.S.

application — Software designed to help you perform a specific task or series of tasks. Applications run from the operating system.

ASCII — American Standard Code for Information Interchange.

asset tag — An individual code assigned to a system, usually by an administrator, for security or tracking purposes.

backup — A copy of a program or data file. As a precaution, back up your system's hard drive on a regular basis. Before making a change to the configuration of your system, back up important start-up files from your operating system.

backup battery — A battery that maintains system configuration, date, and time information in a special section of memory when the system is turned off.

BIOS — Basic input/output system. Your system's BIOS contains programs stored on a flash memory chip. The BIOS controls the following:

- Communications between the processor and peripheral devices
- Miscellaneous functions, such as system messages

bit — The smallest unit of information interpreted by your system.

blade — A module that contains a processor, memory, and a hard drive. The modules are mounted into a chassis that includes power supplies and fans.

BMC — Baseboard management controller.

boot routine — A program that clears all memory, initializes devices, and loads the operating system when you start your system. Unless the operating system fails to respond, you can reboot (also called *warm boot*) your system by pressing <Ctrl><Alt><Del>. Otherwise, you must restart the system by pressing the reset button or by turning the system off and then back on.

bootable diskette — A diskette that is used to start your system if the system will not boot from the hard drive.

BTU — British thermal unit.

bus — An information pathway between the components of a system. Your system contains an expansion bus that allows the processor to communicate with controllers for the peripheral devices connected to the system. Your system also contains an address bus and a data bus for communications between the processor and RAM.

C — Celsius.

cache — A fast storage area that keeps a copy of data or instructions for quick data retrieval. When a program makes a request to a disk drive for data that is in the cache, the disk-cache utility can retrieve the data from RAM faster than from the disk drive.

CD — Compact disc. CD drives use optical technology to read data from CDs.

cm — Centimeter(s).

cmos — Complementary metal-oxide semiconductor.

component — As they relate to DMI, components include operating systems, computer systems, expansion cards, and peripherals that are compatible with DMI. Each component is made up of groups and attributes that are defined as relevant to that component.

COM*n* — The device names for the serial ports on your system.

control panel — The part of the system that contains indicators and controls, such as the power button and power indicator.

controller — A chip that controls the transfer of data between the processor and memory or between the processor and a peripheral.

conventional memory — The first 640 KB of RAM. Conventional memory is found in all systems. Unless they are specially designed, MS-DOS® programs are limited to running in conventional memory.

coprocessor — A chip that relieves the system's processor of specific processing tasks. A math coprocessor, for example, handles numeric processing.

CPU — Central processing unit. See *processor*.

DC — Direct current.

DDR — Double-data rate. A technology in memory modules that potentially doubles the output.

device driver — A program that allows the operating system or some other program to interface correctly with a peripheral. Some device drivers—such as network drivers—must be loaded from the **config.sys** file or as memory-resident programs (usually, from the **autoexec.bat** file). Others must load when you start the program for which they were designed.

DHCP — Dynamic Host Configuration Protocol. A method of automatically assigning an IP address to a client system.

diagnostics — A comprehensive set of tests for your system.

DIMM — Dual in-line memory module. See also *memory module*.

DIN — *Deutsche Industrie Norm*.

directory — Directories help keep related files organized on a disk in a hierarchical, "inverted tree" structure. Each disk has a "root" directory. Additional directories that branch off the root directory are called *subdirectories*. Subdirectories may contain additional directories branching off them.

DMA — Direct memory access. A DMA channel allows certain types of data transfer between RAM and a device to bypass the processor.

DMI — Desktop Management Interface. DMI enables the management of your system's software and hardware by collecting information about the system's components, such as the operating system, memory, peripherals, expansion cards, and asset tag.

DNS — Domain Name System. A method of translating Internet domain names, such as **www.dell.com**, into IP addresses, such as 143.166.83.200.

DRAM — Dynamic random-access memory. A system's RAM is usually made up entirely of DRAM chips.

DVD — Digital versatile disc.

ECC — Error checking and correction.

EEPROM — Electronically erasable programmable read-only memory.

EMC — Electromagnetic compatibility.

EMI — Electromagnetic interference.

ERA — Embedded remote access. ERA allows you to perform remote, or "out-of-band," server management on your network server using a remote access controller.

ESD — Electrostatic discharge.

ESM — Embedded server management.

expansion bus — Your system contains an expansion bus that allows the processor to communicate with controllers for peripherals, such as NICs.

expansion card — An add-in card that plugs into an expansion-card connector on the system board. An expansion card adds some specialized function to the system by providing an interface between the expansion bus and a peripheral.

expansion-card connector — A connector on the system board or riser board for plugging in an expansion card.

F — Fahrenheit.

FAT — File allocation table. The file system structure used by MS-DOS to organize and keep track of file storage. The Microsoft® Windows® operating systems can optionally use a FAT file system structure.

flash memory — A type of EEPROM chip that can be reprogrammed from a utility on diskette while still installed in a system; most EEPROM chips can only be rewritten with special programming equipment.

format — To prepare a hard drive or diskette for storing files. An unconditional format deletes all data stored on the disk.

FSB — Front-side bus. The FSB is the data path and physical interface between the processor and the main memory (RAM).

ft — Feet.

FTP — File transfer protocol.

g — Gram(s).

G — Gravities.

Gb — Gigabit(s); 1024 megabits or 1,073,741,824 bits.

GB — Gigabyte(s); 1024 megabytes or 1,073,741,824 bytes. However, when referring to hard-drive capacity, the term is usually rounded to 1,000,000,000 bytes.

graphics mode — A video mode that can be defined as *x* horizontal by *y* vertical pixels by *z* colors.

group — As it relates to DMI, a group is a data structure that defines common information, or attributes, about a manageable component.

guarding — A type of data redundancy in which a set of physical drives stores data and an additional drive stores parity data. See also *mirroring*, *striping*, and *RAID*.

h — Hexadecimal. A base-16 numbering system, often used in programming to identify addresses in the system's RAM and I/O memory addresses for devices. In text, hexadecimal numbers are often followed by *h*.

headless system — A system or device that functions without having a keyboard, mouse, or monitor attached. Normally, headless systems are managed over a network using an Internet browser.

host adapter — A host adapter implements communication between the system's bus and the controller for a peripheral device. (Hard-drive controller subsystems include integrated host adapter circuitry.)

Hz — Hertz.

I/O — Input/output. A keyboard is an input device, and a monitor is an output device. In general, I/O activity can be differentiated from computational activity.

ID — Identification.

IDE — Integrated drive electronics. A standard interface between the system board and storage devices.

integrated mirroring — Provides simultaneous physical mirroring of two drives. Integrated mirroring functionality is provided by the system's hardware. See also *mirroring*.

internal processor cache — An instruction and data cache built into the processor.

IP — Internet Protocol.

IPX — Internet package exchange.

IRQ — Interrupt request. A signal that data is about to be sent to or received by a peripheral device travels by an IRQ line to the processor. Each peripheral connection must be assigned an IRQ number. Two devices can share the same IRQ assignment, but you cannot operate both devices simultaneously.

jumper — Small blocks on a circuit board with two or more pins emerging from them. Plastic plugs containing a wire fit down over the pins. The wire connects the pins and creates a circuit, providing a simple and reversible method of changing the circuitry in a board.

K — Kilo-; 1000.

Kb — Kilobit(s); 1024 bits.

KB — Kilobyte(s); 1024 bytes.

Kbps — Kilobit(s) per second.

KBps — Kilobyte(s) per second.

key combination — A command requiring you to press multiple keys at the same time (for example, <Ctrl><Alt><Del>).

kg — Kilogram(s); 1000 grams.

kHz — Kilohertz.

KMM — Keyboard/monitor/mouse.

KVM — Keyboard/video/mouse. KVM refers to a switch that allows selection of the system from which the video is displayed and for which the keyboard and mouse are used.

LAN — Local area network. A LAN is usually confined to the same building or a few nearby buildings, with all equipment linked by wiring dedicated specifically to the LAN.

lb — Pound(s).

LCD — Liquid crystal display.

LED — Light-emitting diode. An electronic device that lights up when a current is passed through it.

LGA — Land grid array. A type of processor socket. Unlike the PGA interface, the LGA interface has no pins on the chip; instead, the chip has pads that contact pins on the system board.

Linux — A UNIX-like operating system that runs on a variety of hardware systems. Linux is open source software, which is freely available; however, the full distribution of Linux along with technical support and training are available for a fee from vendors such as Red Hat Software.

local bus — On a system with local-bus expansion capability, certain peripheral devices (such as the video adapter circuitry) can be designed to run much faster than they would with a traditional expansion bus. See also *bus*.

LVD — Low voltage differential.

m — Meter(s).

mA — Milliampere(s).

MAC address — Media Access Control address. Your system's unique hardware number on a network.

mAh — Milliampere-hour(s).

Mb — Megabit(s); 1,048,576 bits.

MB — Megabyte(s); 1,048,576 bytes. However, when referring to hard-drive capacity, the term is often rounded to mean 1,000,000 bytes.

Mbps — Megabits per second.

MBps — Megabytes per second.

MBR — Master boot record.

memory address — A specific location, usually expressed as a hexadecimal number, in the system's RAM.

memory module — A small circuit board containing DRAM chips that connects to the system board.

memory — An area in your system that stores basic system data. A system can contain several different forms of memory, such as integrated memory (ROM and RAM) and add-in memory modules (DIMMs).

MHz — Megahertz.

mirroring — A type of data redundancy in which a set of physical drives stores data and one or more sets of additional drives stores duplicate copies of the data. Mirroring functionality is provided by software. See also *guarding*, *integrated mirroring*, *striping*, and *RAID*.

mm — Millimeter(s).

ms — Millisecond(s).

MS-DOS® — Microsoft Disk Operating System.

NAS — Network Attached Storage. NAS is one of the concepts used for implementing shared storage on a network. NAS systems have their own operating systems, integrated hardware, and software that are optimized to serve specific storage needs.

NIC — Network interface controller. A device that is installed or integrated in a system to allow connection to a network.

NMI — Nonmaskable interrupt. A device sends an NMI to signal the processor about hardware errors.

ns — Nanosecond(s).

NTFS — The NT File System option in the Windows 2000 operating system.

NVRAM — Nonvolatile random-access memory. Memory that does not lose its contents when you turn off your system. NVRAM is used for maintaining the date, time, and system configuration information.

parity — Redundant information that is associated with a block of data.

partition — You can divide a hard drive into multiple physical sections called *partitions* with the **fdisk** command. Each partition can contain multiple logical drives. You must format each logical drive with the **format** command.

PCI — Peripheral Component Interconnect. A standard for local-bus implementation.

PDU — Power distribution unit. A power source with multiple power outlets that provides electrical power to servers and storage systems in a rack.

peripheral — An internal or external device, such as a diskette drive or keyboard, connected to a system.

PGA — Pin grid array. A type of processor socket that allows you to remove the processor chip.

pixel — A single point on a video display. Pixels are arranged in rows and columns to create an image. A video resolution, such as 640 x 480, is expressed as the number of pixels across by the number of pixels up and down.

POST — Power-on self-test. Before the operating system loads when you turn on your system, the POST tests various system components such as RAM and hard drives.

processor — The primary computational chip inside the system that controls the interpretation and execution of arithmetic and logic functions. Software written for one processor must usually be revised to run on another processor. *CPU* is a synonym for processor.

protected mode — An operating mode that allows operating systems to implement:

- A memory address space of 16 MB to 4 GB
- Multitasking
- Virtual memory, a method for increasing addressable memory by using the hard drive

The Windows 2000 and UNIX 32-bit operating systems run in protected mode. MS-DOS cannot run in protected mode.

PS/2 — Personal System/2.

PXE — Preboot eXecution Environment. A way of booting a system via a LAN (without a hard drive or bootable diskette).

RAC — Remote access controller.

RAID — Redundant array of independent disks. A method of providing data redundancy. Some common implementations of RAID include RAID 0, RAID 1, RAID 5, RAID 10, and RAID 50. See also *guarding*, *mirroring*, and *striping*.

RAM — Random-access memory. The system's primary temporary storage area for program instructions and data. Any information stored in RAM is lost when you turn off your system.

RAS — Remote Access Service. This service allows users running the Windows operating system to remotely access a network from their system using a modem.

readme file — A text file, usually shipped with software or hardware, that contains information supplementing or updating the product's documentation.

read-only file — A read-only file is one that you are prohibited from editing or deleting.

ROM — Read-only memory. Your system contains some programs essential to its operation in ROM code. A ROM chip retains its contents even after you turn off your system. Examples of code in ROM include the program that initiates your system's boot routine and the POST.

ROMB — RAID on motherboard.

rpm — Revolutions per minute.

RTC — Real-time clock.

SAS — SCSI Attached Storage.

SATA — Serial Advanced Technology Attachment. A standard interface between the system board and storage devices.

SCSI — Small computer system interface. An I/O bus interface with faster data transmission rates than standard ports.

SDRAM — Synchronous dynamic random-access memory.

sec — Second(s).

serial port — An I/O port used most often to connect a modem to your system. You can usually identify a serial port on your system by its 9-pin connector.

service tag — A bar code label on the system used to identify it when you call Dell for technical support.

simple disk volume — The volume of free space on a single dynamic, physical disk.

SMART — Self-Monitoring Analysis and Reporting Technology. Allows hard drives to report errors and failures to the system BIOS and then display an error message on the screen.

SMP — Symmetric multiprocessing. Used to describe a system that has two or more processors connected via a high-bandwidth link and managed by an operating system, where each processor has equal access to I/O devices.

SNMP — Simple Network Management Protocol. A standard interface that allows a network manager to remotely monitor and manage workstations.

spanning — Spanning, or concatenating, disk volumes combines unallocated space from multiple disks into one logical volume, allowing more efficient use of all the space and all drive letters on a multiple-disk system.

striping — Disk striping writes data across three or more disks in an array, but only uses a portion of the space on each disk. The amount of space used by a "stripe" is the same on each disk used. A virtual disk may use several stripes on the same set of disks in an array. See also *guarding*, *mirroring*, and *RAID*.

SVGA — Super video graphics array. VGA and SVGA are video standards for video adapters with greater resolution and color display capabilities than previous standards.

system board — As the main circuit board, the system board usually contains most of your system's integral components, such as the processor, RAM, controllers for peripherals, and various ROM chips.

system configuration information — Data stored in memory that tells a system what hardware is installed and how the system should be configured for operation.

system diskette — See *bootable diskette*.

system memory — See *RAM*.

System Setup program — A BIOS-based program that allows you to configure your system's hardware and customize the system's operation by setting features such as password protection. Because the System Setup program is stored in NVRAM, any settings remain in effect until you change them again.

system.ini file — A start-up file for the Windows operating system. When you start Windows, it consults the **system.ini** file to determine a variety of options for the Windows operating environment. Among other things, the **system.ini** file records which video, mouse, and keyboard drivers are installed for Windows.

TCP/IP — Transmission Control Protocol/Internet Protocol.

termination — Some devices (such as the last device at each end of a SCSI cable) must be terminated to prevent reflections and spurious signals in the cable. When such devices are connected in a series, you may need to enable or disable the termination on these devices by changing jumper or switch settings on the devices or by changing settings in the configuration software for the devices.

UNIX — Universal Internet Exchange. UNIX, the precursor to Linux, is an operating system written in the C programming language.

uplink port — A port on a network hub or switch used to connect to other hubs or switches without requiring a crossover cable.

UPS — Uninterruptible power supply. A battery-powered unit that automatically supplies power to your system in the event of an electrical failure.

USB — Universal Serial Bus. A USB connector provides a single connection point for multiple USB-compliant devices, such as mice and keyboards. USB devices can be connected and disconnected while the system is running.

utility — A program used to manage system resources—memory, disk drives, or printers, for example.

UTP — Unshielded twisted pair. A type of wiring used to connect systems in a business or home to a telephone line.

V — Volt(s).

VAC — Volt(s) alternating current.

VDC — Volt(s) direct current.

VGA — Video graphics array. VGA and SVGA are video standards for video adapters with greater resolution and color display capabilities than previous standards.

video adapter — The logical circuitry that provides (in combination with the monitor) your system's video capabilities. A video adapter may be integrated into the system board or may be an expansion card that plugs into an expansion slot.

video driver — A program that allows graphics-mode application programs and operating systems to display at a chosen resolution with the desired number of colors. Video drivers may need to match the video adapter installed in the system.

video memory — Most VGA and SVGA video adapters include memory chips in addition to your system's RAM. The amount of video memory installed primarily influences the number of colors that a program can display (with the appropriate video drivers and monitor capabilities).

video resolution — Video resolution (800 x 600, for example) is expressed as the number of pixels across by the number of pixels up and down. To display a program at a specific graphics resolution, you must install the appropriate video drivers and your monitor must support the resolution.

W — Watt(s).

WH — Watt-hour(s).

win.ini file — A start-up file for the Windows operating system. When you start Windows, it consults the **win.ini** file to determine a variety of options for the Windows operating environment. The **win.ini** file also usually includes sections that contain optional settings for Windows application programs that are installed on the hard drive.

Windows 2000 — An integrated and complete Microsoft Windows operating system that does not require MS-DOS and that provides advanced operating system performance, improved ease of use, enhanced workgroup functionality, and simplified file management and browsing.

Windows Powered — A Windows operating system designed for use on NAS systems. For NAS systems, the Windows Powered operating system is dedicated to file service for network clients.

Windows Server 2003 — A set of Microsoft software technologies that enable software integration through the use of XML Web services. XML Web services are small reusable applications written in XML that allow data to be communicated between otherwise unconnected sources.

XML — Extensible Markup Language. XML is a way to create common information formats and to share both the format and the data on the World Wide Web, intranets, and elsewhere.

ZIF — Zero insertion force.

Index

A

AC power present indicator, 20

asset tag utility, 54

Avocent Analog KVM switch module, 22

Avocent Digital Access KVM switch module, 24

B

baseboard management controller, 54
  BMC, 54

batteries
  troubleshooting, 115

battery, 88
  installing, 88
  removing, 88

BMC, 54

boot drive
  configuring, 91

C

checking equipment, 102

closing
  server modules, 76

configuring
  boot drive, 91

connectors
  system board, 123

D

damaged systems
  troubleshooting, 107

daughter card
  installing, 82
  status indicator, 15

Dell
  contacting, 132

diagnostics
  advanced testing options, 119
  error messages, 120
  running from the utility partition, 118
  see *system diagnostics* and *Server Administrator diagnostics*
  testing options, 119

DIP switches
  about, 121

DRAC/MC module, 26, 61
  fault indicator, 27
  installing, 62
  link activity indicator, 26
  link indicator, 26
  master/slave indicator, 27
  removing, 61
  troubleshooting, 109

drive carrier
  SATA hard drive (SATA), 91

E

error messages, 43

F

fan module indicators, 21

fan present indicator, 21

fans
  installing, 61
  removing, 60
  troubleshooting, 108

features
  Avocent Analog KVM switch module, 22
  Avocent Digital Access KVM switch module, 24
  back-panel, 18
  DRAC/MC module, 26
  Fibre Channel pass-through module, 31
  Fibre Channel switch module, 32
  Gb Ethernet pass-through module, 33
  hard drive, 16
  I/O connectivity, 27-28
  Infiniband pass-through module, 32
  KVM selection, 15

features *(continued)*
PowerConnect 5316M Ethernet switch, 29
server module, 12
server module power button, 14
system, 10
system control panel, 11
system identification, 11
system status, 10
Fibre Channel pass-through module, 31
Fibre Channel switch module, 32

G

Gb Ethernet pass-through module, 33
getting help, 127
guidelines
memory installation, 78

H

hard drive
installing SATA in a SATA drive carrier, 91
removing from a drive carrier, 91
hard drives, 89
features, 16
installing, 90
integrated mirroring, 89
removing, 90
troubleshooting, 113
help
getting, 127

I

I/O bays
configurations, 29
populating, 28
identification indicator, 12
indicators
AC power present, 20
daughter card status, 15
DC power, 20
DRAC/MC fault, 27
DRAC/MC link, 26
DRAC/MC link activity, 26
DRAC/MC master/slave, 27
fan fault, 21
fan module, 21
fan present, 21
Fibre Channel pass-through module, 32
identification, 12
KVM selection, 15
power supply, 19
power supply fault, 20
PowerConnect 5316M Ethernet switch diagnostic, 30
PowerConnect 5316M Ethernet switch duplex mode, 30
PowerConnect 5316M Ethernet switch speed/link, 30
server module power selection, 14
indicators *(continued)*
system control panel, 11
system power, 11
Infiniband pass-through module, 32
installing
battery, 88
daughter card, 82
DRAC/MC module, 62
fans, 61
hard drives, 90
KVM module, 63
memory, 80
memory guidelines, 78
network switch module, 72
power supplies, 59
SATA hard drive in a SATA drive carrier, 91
server module components, 77
server modules, 74
system components, 57
integrated mirroring, 89

K

keyboards
troubleshooting, 103
KVM module, 63
custom cable, 22
installing, 63
removing, 63
KVM selection button, 15
KVM selection indicator, 15

M

memory
installing, 80
troubleshooting, 112
upgrade kits, 77
upgrading, 77

memory modules
removing, 82

messages
alert, 41
error messages, 43
server module, 34
system diagnostics, 40
systems management, 105
warning, 40

microprocessors
server modules, 84
troubleshooting, 114

mouse
troubleshooting, 104

N

network switch module, 70
installing, 72
removing, 71
troubleshooting, 110

O

opening
server modules, 75

options
system setup, 44

OSCAR, 24

P

password
disabling, 126

password features
setup, 51
system, 51

passwords
disabling, 54
setup, 53
system, 51

power supplies, 58
installing, 59
removing, 58
troubleshooting, 107

PowerConnect 5316M Ethernet switch
diagnostic indicator, 30
duplex mode indicator, 30
speed/link indicator, 30

PowerConnect 5316M Ethernet switch module, 29

R

removing
battery, 88
DRAC/MC module, 61
fans, 60
hard drive, 90
hard drive from a drive carrier, 91
KVM module, 63
memory, 82
network switch module, 71
power supplies, 58

removing *(continued)*
server module components, 77
server modules, 73
system components, 57

S

safety, 101

securing your system, 52

server module
battery, 88
status indicators, 12

server module board
troubleshooting, 114

server module components
installing, 77
removing, 77
troubleshooting, 110

server module power button, 14

server modules, 73
closing, 76
installing, 74
microprocessors, 84
opening, 75
removing, 73

setup password
assigning, 53
changing, 54
using, 53

setup password enabled
working with, 53

setup password features, 51

status indicators
server module status, 12

support
contacting Dell, 132
system board
connectors, 123
system components
installing, 57
removing, 57
system control panel, 11
system fans, 59
system features, 10
system password
assigning, 51
changing, 53
deleting, 53
using, 51
system password features, 51
system power button, 11
system power indicator, 11
system setup
entering, 43
entering BMC, 55
options, 44
using, 44
system setup screens
console redirection, 49
integrated devices, 48
main, 44
system security, 49
system status features, 10

T

technical assistance
obtaining, 127
troubleshooting
battery, 115
damaged system, 107
DRAC/MC module, 109
external connections, 102
fans, 108
hard drive, 113
keyboard, 103
memory, 112
microprocessors, 114
mouse, 104
network switch module, 110
power supplies, 107
server module board, 114
server module components, 110
start-up routine, 101
USB devices, 105
video, 102
wet system, 106

U

upgrading
memory, 77
USB
CD drive, 17
devices, troubleshooting, 105
diskette drive, 17
using
USB CD drive, 17
USB diskette drive, 17
using system setup, 44

V

video
troubleshooting, 102

W

warranty, 9
wet systems
troubleshooting, 106